HONI SOIT QUI MAL Y PENSE
DIEU ET MON DROIT

ICULTURAL RESEARCH INSTITUTE
PUSA

PHILOSOPHICAL
Tranſactions:

GIVING SOME

ACOMPT

OF THE

Preſent Undertakings, Studies and Labours

OF THE

INGENIOUS

IN MANY

CONSIDERABLE PARTS

OF THE

WORLD.

VOL. IV.

For *Anno* 1669.

LONDON
Printed by *T. N.* for *John Martyn* at the Bell, a little without
Temple-Bar, Printer to the *Royal Society*, 1670.

To the Right Reverend Father in God
SETH Lord Biſhop of *SARUM.*

My LORD,

I *Apprehended it my Duty in many reſpects to dedicate to your Lordſhip this ſmall Volume of the* Philoſophical Tranſactions. *For We ought to remember, that 'tis now about* 15 *or* 16 *years, ſince your Lordſhip Geometrized* Aſtronomy, *which did oblige the chief Aſtronomers of this Learned Age: And that you added Life to the* Oxonian *Sparkles; I mean that Meeting, which may be called the* Embryo *or Firſt Conception of the* Royal Society*: And that to vindicate our Univerſities from a general Deluge, when many had a ſiniſter mind againſt them,* You *appeared publickly, even in thoſe rough times,* Academiarum Vindex. *Whence we may juſtly inferr, that you will receive much comfort to ſee both Univerſities contribute ſo effectually by their valuable Works to the Advancement of ſolid Learning: In* Oxford *for the* Mathematicks *and* Mechanicks; *as you may find here in the Abbreviation of* Mechanica *ſive* de Motu *&c. And we had here alſo given you the Brief of a Noble Argument from* Cambridge *concerning* Opticks, *if we had not waited for ſome* Geometrical Lectures *from the ſame Worthy Author, proper to be publiſht with thoſe his* Opticks. *And if in the fore-going* Volume *ſome of the chief Branches of the Mathematicks, Algebra, and other parts of real Philoſophy (in which your Lordſhip with much affection and ſucceſs hath theſe many years been happily concerned) were diligently ſollicited for the benefit of the Studious in thoſe excellent Sciences; I hope, we may not immodeſtly ſay, that in this Volume we have given an Accompt of ſome further Improvements in the ſame kind (N.* 45. 46. 49; *) and of a foundation laid, and in ſome* Tables *commenced for the rectifying of* Aſtronomy *by obſerving Celeſtial Appearances in our Engliſh Horizon, by a Learned and Ingenuous Perſon who profeſſeth good reſpects and readineſs of ſervice to the* R. Society *N.* 55.

My Lord, *I muſt bear forbear at large to repreſent, How much you have contributed to the promoting all parts of conſiderable knowledge, both by your own private Studies, and in Juncture with the ſaid* Society *ſince its* Inſtitution. *I muſt be rather careful, that* *this my free Addreſs may have no appearance of uncomly obſequiouſneſs, but may be ſupported by firm grounds of ſober and generally acknowledged Truth. And in this Age of Calumny we have good cauſe to rejoyce in the Conſpicuous Examples of ſuch, as have perſonally aſſiſted, and therein proved their fitneſs to officiate, at the higheſt Altars, for the Government, and for the Safety and Ornament of the Church, and who withall have made the deepeſt Reſearches into the Works of God, of Nature, and of Art. Thus it was in the firſt Model of the World, before fruitleſs Controverſies and verbal Altercations had made a wide difference between the* Works of God *and the* Notions of Men. *Antiquity attributes the firſt Monumental Hieroglyphicks to* Seths Pillars; *the firſt Naval Architecture to* Noah; *the Syderal Arts to* Abraham; *the Holy Utenſils, fitteſt for a portable Tabernacle, to* Moſes; *the Architecture of the faireſt Temple to* Solomon; *and generally the moſt Uſeful Sciences, to the no leſs Devout than Wiſe Men of the Eaſt. And thoſe Illuſtrious Propagators of the Goſpel, who in the Primitive conflicts and diſtreſſes of the Church were enabled to diſpell the darkeneſs of the Gentiles, both by their Writings and Sufferings, were many of them the beſt Philoſophers of thoſe Ages; at leaſt of thoſe Countryes, where they diſpenſed the Heavenly Myſteries.*

*This Congratulation we owe more particularly to your Lordſhip for thoſe Divine Diſcourſes, in which you have publickely refuted A*theiſme, *and with it thoſe Men, who ſtand in their own light, in denying the beſt Evidences of their own Priviledges and their ſureſt Titles to an Happy Eternity. And hence alſo the Senſualiſts and Men of Animoſities and of a endleſs Contentions may learn, that they, who follow cloſeſt to the ſtreight Line, and are in the neareſt approaches to the Center of Truth, and to the Fountain of Purity, as they are more ſecur'd from Deviations, and the loſs of Time, ſo they have freer Spirits and better leiſure to advance the General Benefit of Mankind. And hence I account myſelf well aſſured of your Lordſhips countenance, whilſt I am faithfully devoted to theſe ends, being always*

My LORD

Your Lordſhips

Very Humble and much Obliged Servant

Henry Oldenburg Soc. Reg. Sec.

Trans:-N° 45

Fig. I.

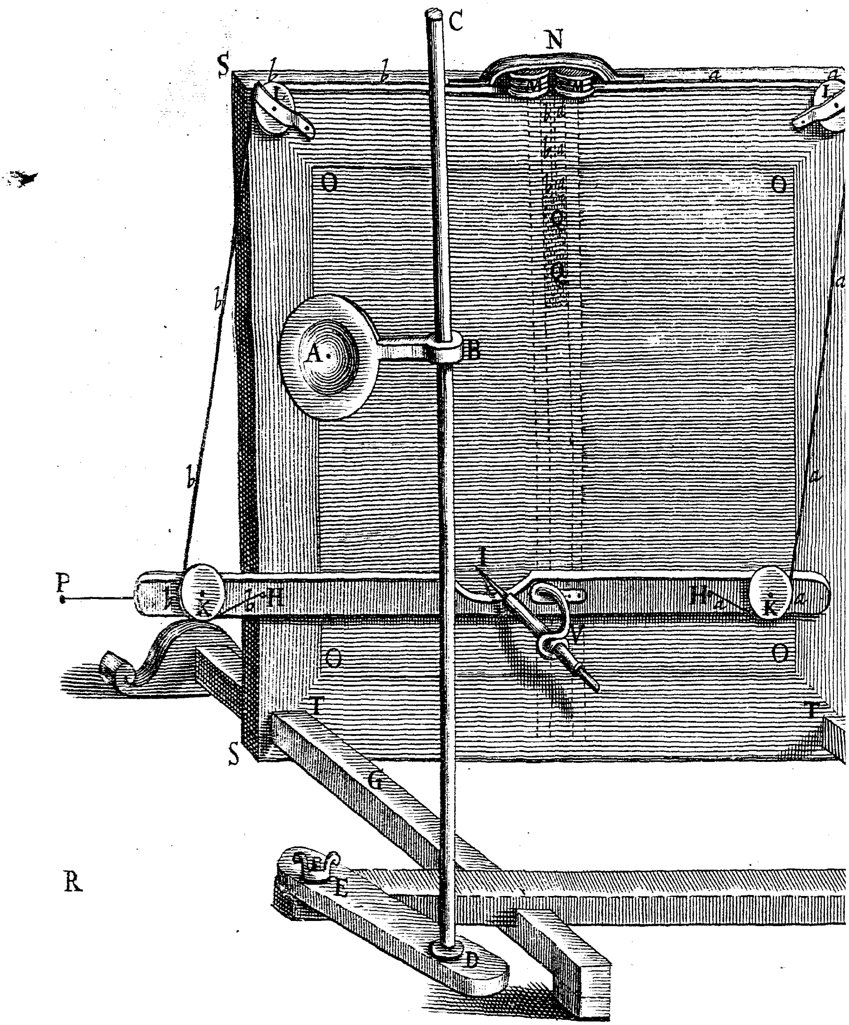


Fig. II.

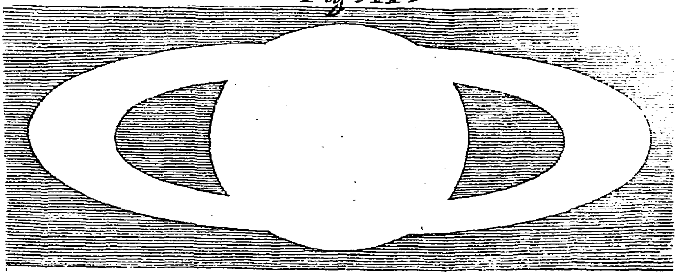


Fig. IV.

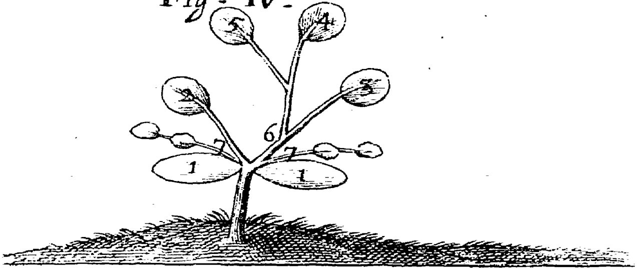
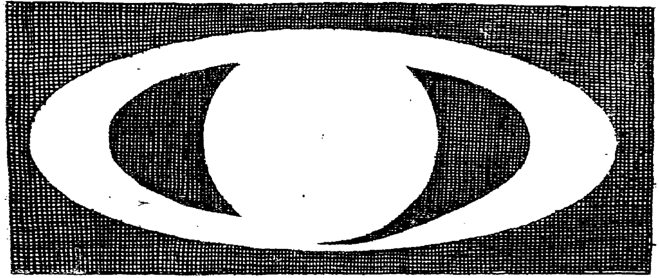
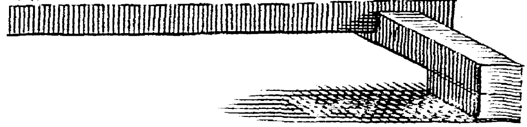


Fig. III.





Numb. 45.
Beginning the Fifth Year.

PHILOSOPHICAL TRANSACTIONS.

March 25. 1669.

The Contents.

A Preface to the Fifth *year of theſe* Tranſactions, *which is herewith begun. The Deſcription of an Inſtrument for drawing any Object in* Perſpective. *An Obſervation of* Saturn, *rectifying ſome former Obſervations of that Planet. An Extract of a Letter, written from* France *to the Publiſher, concerning the Ordering of* Melons. *An Account of two Books.* I. *Renati Franciſci Sluſii MESOLABUM, 2ª Editio auctior.* II. *Tractatus de CORDE, item de Motu & Colore SANGUINIS, &c. A. Richardo Lower, M.D.*

A PREFACE
To this *Fifth* Year of the Tranſactions.

I*T may perhaps be expected, that here at the Entrance into the* Fifth *Year of theſe Philoſophical Communications, ſomething ſhould be prefac'd, as hath been done formerly for an Introduction into each of the Four preceding years, beginning always (according to the* Engliſh *Accompt) in the Moneth of* March. *Briefly then, I ſhall make a few freſh Reflections on what is paſt, to the purpoſe of Impreſſing ſome few things perhaps not altogether inconſiderable; And thence offer a Proſpect of what may be hoped to be the Product of our future Endeavours, as God ſhall vouchſafe to proſper them.*

In the firſt *Volume, containing the Tranſactions of* Two *Years,* 1665, 1666. *though we were fatally interrupted by the* Plague, Wars, *and the horrible* Conflagration *of our* Metropolis; *yet we then made an Attempt of laying ſome Foundation for the Improvement of real Philoſophy, and for the ſpreading of Uſeful knowledge; in publiſhing Advices and Directions for the writing of an Experimental Natural Hiſtory; in pointing out Eſſays, Patterns and Exemplars, that have hitherto been deſigned in that kind; in giving notice of divers Artificial Engins and Inſtruments, which may be helpful for the further Diſcoveries of* Nature, *or for the greater performances of* Art. *We ſought out, how far Art had then arriv'd towards the perfecting of the* Microſcope; *and by what means that curious Inſtrument might be advanc'd; and what Informations it would afford us, either upon the view of minuteſt Bodies; or of the Texture, Surface, Poroſities, Smoothneſs or Inequalities of other Bodies, that were in our power for ſuch approaches. The like care we had for* Teleſcopes, *by what Operations, Engins, and Applications they might be further improv'd; and what was the moſt, they could thus far perform. Then we related the Finding out of the Rotation of ſome of the* Planets, *and the Changeableneß, and Seaſons of abſence, or Obſcurity in ſome of the* Fixt Stars, *or ſuch as ſeem'd to be of their Train. And never, I think, were* Comets *ſo chaced, their Figures and Appearances ſo detected, their Motions almoſt reduced to Rule, and in a manner predicted; the* Solar Eclipſe *in ſeveral and diſtant places carefully calculated. And not to recite here, what was attempted and done by* Burning-Glaſſes; *I ſhall but name the Inſtruments deviſ'd to* Meaſure *the* Weight *and the Changes of Weight of the* Air, *and other aſcending and deſcending* Fluids, *either with the Preſſure of the whole Atmoſphere, or of ſmaller parcels freed from that Preſſure; I mean the* Baroſcopes, *and the* Pneumatick Engins. *There were alſo offred* Hygroſcopes, *to note the degrees of* Drought *or* Moiſture *in the Air;* Thermometers *to meaſure the degrees of* Heat *and* Cold; *and an Inſtrument to* graduate *Thermometers to make them* Standards *of* Heat *and* Cold; *an Inſtrument to meaſure the* Refractions *of* Liquors *of all kinds, for eſtabliſhing the Laws of Refraction;* Hydroſtaticks *to meaſure the Weight of Liquids, and divers other Contrivances to find out the Statical poſition, tendency and gravitation of Liquids in all parts. Beſides, Engins to break the hardeſt Rocks; Huge Wheels, and other Engins for Mines deſcribed; To raiſe Winds, by the fall* *of Waters; An Inſtrument to examine the greateſt Depths of the Seas; Another, to try for freſh waters in the bottoms of ſome Seas;* Pendulum-watches *to aſcertain* Longitudes. *But I muſt refer to a greater ſtore of ſuch uſeful Inventions commemorated by* M^r Sprat *in his Hiſtory of the* R. Society.

Neither had I here mention'd theſe, but to give this Advertiſement; That ſometimes one of theſe Inſtruments may open a fair Portal for more Volumes of the moſt obliging Philoſophy, than can be abſolv'd by many hands in ſome Ages. It will not be meer Preface, *but cloſely agreeable to the Intention of theſe Tracts, if I here inſtance one particular, which may poſsibly ſeem to ſome of the loweſt value, and yet may chance to prove of greater importance, than at firſt we are apt to imagine. I will name good* Scales, *both of the niceſt kinds, and ſome of a ſtronger frame. Now this I would repreſent. 'Tis certain, ſome Bodies do increaſe their weight in a ſtrong Fire: See the Experiment in the ſaid Hiſt. of the* R. Society, *p.228. And Honorable* M^r Boyle *hath proved, That even* Solid *and* Coldeſt *Bodies have their* Atmoſpheres; *Some their* Electricity; *and ſome their* Magnetiſmes: *And 'tis palpable, that ſome draw more Aliment, either from the Earth, or from ſubterraneous Liquors, or Spirits, or from the Nutritious parts of the Air, or other Influences, which deſcend through the Air, than they expend in their Atmoſpheres; And perhaps more at certain* State *times, till they have acquired their due Increment. This being obſerv'd, it ſeems eaſie to deviſe, How to examine by* Scales, Glaſſes, *and ſuch ſlight furniture, whence Vegetables, many kinds of Stones, Metals, and other Minerals, have more or leſs of their Increment, and whence they obtain the ſtronger Fermentation, which conſerves them, or promotes their perfection in their kind: Whether Glaſs, or what other Materials, do obſtruct or retard the reſort of any or all of theſe Spirits, Heats, or Influences: Whether* Ever-greens, *the moſt fragrant or ſtrong-ſenting, hot or cold Plants, draw more of their ſubſtance from the free Air; and which draw more from the ſubterraneal ſupplyes. And ſo we may examine Earths; and Minerals. We ſee many Tracts of Land, which yield peculiar Ferments, ſometimes* Vitriolate *Earth, ſometimes* Aluminous, *ſometimes* Nitrous, *ſometimes* common-Saline, *healing* Bolus's, *and Earth proper for* Fullers, Tobacco-pipes, *&c. Sometimes the Ferment is ſo hot, as to hollow the ſurface faſter than can eaſily be* *allay'd by Mixtures of a more ſullen ſoyl. And ſometimes the Natural ſurface is ſo ſullen, as to ſwallow and devour the richeſt Compoſt, before it rewards the induſtrious Husbandman or Gardner: And ſome do highly pretend to make by Art* Nitri-fodinas perpetuas; *to deviſe the* Magnets, *which ſhall draw to our Uſe the* Alimental Nitre of the Air. *I ſhall not ſtay to engage for or againſt either of theſe: but by thoſe curious Utenſils we may ſoon examine, What may be done in good earneſt, and how far clear Experiments will anſwer to thoſe alluring promiſes. And though we ſhould fail of the Particulars, yet thence we may chance to dive into ſome Secrets of very uſeful Philoſophy, and find other Influences, than are either* Electrical, *or in the common ſenſe* Magnetical, *but pregnant to diſcloſe the Cauſes, and to remove the Defects of Fertility, and to impart other no leſs valuable vertues. For there are more kinds of Vegetables than are commonly ſo call'd, or ſo conſider'd; as our Hiſtory of* Oſteo-colla, *and the beautiful* Stone-plants *growing on the hard Rocks in* Jamaica *(to omit many other Inſtances) do teſtifie. And we ſee by Experience, that peculiar Earths,* Fullers Earth, Tarras *for Veſſels, and ſome kinds of Stones, and of Mineral Ores, have their real Increaſe of Subſtance in their times of Seaſons, and proper places. Many Noble Perſons are Lovers of Gardens, and are willing to entertain* Exoticks; *and are provided of the* Rocks, Grots, *and* Crypta's: *Poſſibly, if they ſhall have a deſire to ſearch into the Cauſes of theſe over-hot ferments, and of the ſlow-pac'd duller Earth, they may happily find unexpected Treaſures in their own private Incloſures. The* Spade *and* Pick-ax *will ſhew the proximate Cauſes, or at leaſt ſome of the Concomitants of every kind of Fertility, and of every kind of Barrenneſs; and the* Scales *will diſtinguiſh real and ſubſtantial growth, and the ſeaſons of it, from deceiving Expanſions: And then, by Arches and Vaults, by opening Springs, by heaps of Stones, here of Lime-ſtones, there of Marl-ſtones, and in ſeverals of Pebbles, white and black Flints, Marcaſites, Mineral Ores, Magnets, and Bodies of the ſtrongeſt Electricity, where they may be had, ſome laid as in their Natural Beds, and ſome dislodged in an unkind poſture, we may* Artificially *frame ſuch ſubterraneous Furnaces and Stoves, as may, by a calm Proceſs, afford us ſome of the Wonders of Divine Chymiſtry. And thus we may have refrigerating* Conſervatories *for cooling* Lenitives. *Here we may feed moiſtning,*

ning, drying, oily, acid, embalming, tartarous, and every other ſort of Steams and Vapours: And what every Maſs effects upon the Confiners at what ſeaſons, and at what diſtance, the Scales *and other Implements may detect. The Ingenious* Sanctorius *hath not exhauſted all the reſults of* Statical *Indications. They may ſerve to calculate or weigh all* ſorts *of Tranſpirations, to diſcriminate Generative, Nutritive, Sanative, Reſtorative, and Benigne, from Maleficiate and Noxious Spirits; and may inſtruct us how to guard from what is hurtful, and how to retain that which is congenial. This* Memorandum *was due to thoſe Worthies, who have contrived theſe Philoſophical Tools; and who, in deſpight of Calumny and Raillery, have in theſe and many other reſpects deſerv'd as great Names (I muſt ſay this ſoftly) as they, who have adorn'd the beſt Records of foregoing Ages. But to return; Here in this* firſt *Volume were alſo diſpatch'd* Enquiries *and* Directions *for all Travellers by Sea and Land, for our Correſpondents and all Ingenious perſons reſiding in the more famous parts of the World; to review, and return a ſafe Teſtimony of all ſuch Obſervables of Nature and Excellencies of Art, as carry the greateſt fame, or ſeem moſt conſiderable for Uſe or Inſtruction. We have furniſht particular* Inquiries *for* Mines, *for* Seas, *for* Springs, *and for the Effects of the late Invention of* Transfuſing Bloud, *and* Medicated Liquors *into the Veins of Animals.*

In the ſecond *Volume, containing the* Tranſactions *of the Year* 1667. *we ſpread ſomewhat more largely abroad the* Inquiries *proper for more places of principal note; and then we received from our Correſpondents, and publiſh'd, many not un-inſtructive* Anſwers. *And here were added more* Inſtruments *of* Art, *ſome newly deviſed, as an Inſtrument for* Meaſuring *the* Diameters *of Planets to great exactneſs. We offered fuller Directions for* Sea-voyages; *collected divers* Anomatical *reſearches; related many odd effects of the* Transfuſion *of* Bloud, *and of Medicins into the Veins of Animals; a deeper Inveſtigation and further Accompts of* Reſpiration; *a diſſected Animal preſerv'd alive by the Wind of Bellows; the Influence of Air upon the Life and Growth of Vegetables, upon Luminous Bodies, and Burning Coals, &c.*

In the third *Volume, for the Year* 1668. *(beſides a good ſtore of Inſtructive Anſwers to the former Inquiries, and ſome further Progreſs in the diſcloſures of Nature) hath been introduc'd ſomething of*

Algebra, *and other branches of the* Mathematicks *and* Mechanicks, *for the uſe of thoſe that are ſtudious in thoſe Noble Arts, as well to direct in the beſt Methods, and to detect Erroneous adventures, for the behoof of generous Beginners, as for the ſatisfaction and further encouragement of them that have attain'd higher accompliſhments.*

Alſo, in each of theſe Volumes, *hath been given the* Breviate *and Subſtance of ſuch Philoſophical Writings, as came abroad, and were thought of good worth. And all along we have interſpers'd many Hiſtories, Philoſophical Obſervations and promiſcuous Experiments.*

And now, I think, we may take our Proſpect, and ſee, that we have got more ground in our ſecond Volume than in the firſt; and more yet in the third than in either of the former; whence we take the liberty to ominate well for the future. Yet in all this I aſſume nothing to my ſelf, but give all what is due to the merits of my generous Correſpondents. And all that have affections for Arts and Sciences may rejoyce to ſee the late Proficiency of the Ingenuous and Nobler Students in both our famous Univerſities, *and in all the Univerſities of Chriſtendom. The Ingenious* French *have drawn the ſame Yoke with us, in publiſhing their* Journal des Scavans; *and the* Romans *have followed our Example in their* Giornale de Letterati. *And doubtleſs all* Civil *Nations, who have a Guſt for uſeful knowledge, will, in good time, drive on this Example; and then, as the Light increaſeth, and runs on, we ſhall in a like proportion become ſo many mutual Ayds to each other: And this will hopefully redound to the General good of Mankind.*

I doubt not but the Reader *will pardon the Prolixity of this* Preface, *ſince, as was promis'd, it is not onely Preface, but bears a part of my main buſineſs, which is, to excite and animate the Induſtry and free Communications of others; of ſome of whoſe Effects take for the preſent the* Specimens *following.*

The Deſcription

Of an Inſtrument invented divers years ago by D^{r} Chriſtopher Wren, *for drawing the Out-lines of any Object in Perſpective.*

SEe *Fig.* I. wherein *A.* is a ſmall *Sight* with a ſhort arm *B.* which may be turn'd round about, and mov'd up and down the ſmall Cylinder *CD.* which is ſcrew'd into the piece *ED.* at *D.* this piece *E D* moving round about the Center *E*; by which means the *Sight* may be remov'd either towards *R* or *F*.

EF is a *Rule* faſtn'd on to the two *Rulers GG*, which Rulers ſerve both to keep the ſquare Frame *SSSS* perpendicular, and by their ſliding through the ſquare holes *TT*, they ſerve to ſtay the *Sight*, either farther from or nearer to the ſaid Frame; on which Frame is ſtuck on with a little wax the paper *OOOO*, whereon the Picture is to be drawn by the *Pen* I. This Pen I. is by a ſmall *Braſs-handle V*. ſo fixt to the *Ruler HH*, that the point I. may be kept very firm, ſo as alwayes to touch the Paper.

HH. is a *Ruler*, that is alwayes, by means of the ſmall ſtrings *aaaabbbb*, mov'd *Horizontally*, or *Parallel* to it ſelf; at the end of which is ſtuck a ſmall Pin, whoſe head *P* is the *Sight*, which is to be mov'd up and down on the *Out-lines* of any Object.

The Contrivance of the *Strings* is this. The two Strings *aaa, bbb.* are exactly of an equal length. Two ends of them are faſtn'd into a ſmall Leaden *Weight Q Q*, which is mov'd in a *Socket* on the back-ſide of the Frame, and ſerves exactly to counterpoiſe the *Ruler HH*, being of equal *weight* with it. The other two ends of them are faſtn'd to two ſmall Pins *H.H*, after they have been roled about the ſmall *Pulleys N. MM. LL. KK*; by means of which *Pulleys* if the *Pen* I. be taken hold of and mov'd up and down the Paper, the Strings moving very eaſily, the *Rule* will always remain in an *Horizontal* poſition.

The manner of Uſing it is this: Set the *Inſtrument* on a Table, and fix the *Sight A.* at what height above the Table, and at what diſtance from the Frame *SSSS*, you pleaſe. Then, looking through the Sight *A*, and holding the Pen I. in your hand, move the Head of the Pin *P.* up and down the Out-lines of the Object, and the point I. will deſcribe on the Paper *OOOO*. the Shape of the Object ſo trac'd.

An Obſervation

Of Saturne, *made at* Paris, *the* 17th *of* Auguſt, 1668. *at hor.* 11½, *at night, by* M. Hugens, *and* M. Picart; *as 'tis deſcrib'd in the* Journal des Scavans *of Febr.* 11. 1669.

THe Obſervers, imploying a Teleſcope of 21 Foot, ſaw the Planet *Saturn*, as 'tis repreſented by *Fig.* II. the Globe in the midle manifeſtly appearing both above and below beyond the Ovale of his Anſes; which was hardly diſcernable the laſt year.

They meaſur'd divers ways the Inclination of the *Great Diameter* of the Ovale to the *Equator*, which (Inclination) was found of about *Nine* degrees, although at that time it ſhould not be but of *Four* degrees, according to what M. *Hugens* hath affirm'd in his Syſteme of *Saturn*, *viz.* that the Plan of the Ring, which environs the Globe of this Planet, is inclin'd to the Plan of the *Ecliptique* but 23 *deg.* 30. *m.* But this laſt Obſervation and other like ones of this and the precedent Year being more exact, and made at a time more proper for meaſuring that obliquity, than were thoſe, which had formerly ſerved for a foundation to determine it; M. *Hugens* finds that, in ſtead of 23. *deg.* 30. *m.* the Angle of the Plans of the Ring and of the Ecliptique muſt be of 31. *deg.* or thereabout; and that being ſo, that not onely the Shape, which *Saturn* hath at preſent, but alſo all thoſe, that have been noted ſince the true ones were obſerved, do perfectly agree with the *Hypotheſis* of the Ring; and particularly that of 1664. in the beginning of *July* *, which was made, and made publick by *Signior Campani*, wherein the Great Diameter is double to the Leſſer.

As to the round *Phaſis* of *Saturn*, that Change of the Inclination, which was juſt now ſpoken of cannot alter the time of it but very little or nothing; ſo that M. *Hugens* ſtill exſpects this Apparance in 1671. when in the Summer of that Year *Saturn* will begin to looſe his *Anſes*, there being then to remain onely the Globe in the Midle; and will not recover them but about a

---

* See *Fig.* 3. as 'tis to be found in the *French* Letters, written by M. *Auzout* to M. *L'Abbé Charles*, and printed at *Paris*, A. 1665. upon the occaſion of the *Ragguaglio di due Nuove Oſſervationi da Giuſeppe Campani.*

year after, according to what he hath ſaid in his Book of the *Syſteme* of *Saturn*.

An Extract

Of M. Dela Quintiny's *Letter, written to the* Publiſher *in* French *ſometime agoe, concerning his way of Ordering* Melons; *now communicated in* Engliſh *for the ſatisfaction of ſeveral curious Meloniſts in* England.

I Shall now anſwer to that particular of your Letter, which concerns *Melons*, as exactly as I can. All the *Seeds*, I ſent you, produce *Melons* with a thin and ſomewhat embroider'd skin, not divided by Ribbs: Some of them have their skin whitiſh, others of the Colour of *Slate*. The Melons themſelves are not very great, their fleſh very red, dry, melting upon the tongue; not mealy, and of a high taſte. And theſe are the two onely kinds, which, after I have tried above an hundred different ſorts, I make uſe of, and ſend you, not having obſerv'd any change in them, after the uſe of 20 years.

As to the *manner* of *cutting* them, you know, that the firſt thing appearing of them, are two Leaves united, here called *Ears* (mark't in *Figure* IV. by 1.1.) Out of the midſt of theſe two Ears there ſhoots, ſome days after, firſt one Leaf, which we call the *firſt* Leaf or *Knot* (mark't 2.) and out of the ſame place, after ſome days more, ſhoots a *ſecond*, call'd the *ſecond knot* (mark't 3.) Out of about the midſt of the Stalk of this ſecond knot ſhoots the *third knot* (mark't 4.) And this *third* knot it is, which muſt be cut at the place markt *6*. without hurting the branch of the ſecond knot, whence this third came; becauſe that from that place will ſpring a branch, which we call the *firſt Arm*, and this Arm will ſhoot forth firſt one knot, then a ſecond, then a third; and this third it is, you are to cut again in the ſame manner, as was ſaid before. And you muſt be careful to cut theſe *third* knots, without ſtaying for the ſhooting of the *fourth* or *fifth* ones. You'l ſee out of every knot come forth Arms or Branches like to the *firſt*, ſpoken of before; and it is at thoſe Arms, that the Melon will be produced. And they will be good, if the foot or root be well nouriſh't in good earth, and cheriſh't by a good hot-bed and the Sun. But let the foot of the Melon never paſs into the dung, nor the earth be water'd but moderately, when you ſee it grows too dry, ſo as the ſhoot might thereby ſuffer; which yet you muſt not delay, till it happen, leſt the remedy come too late. I water twice or thrice a week in very hot weather, and that about Sun-ſet; and I cover my Melons with a Straw-mat from eleven of the Clock in the fore- to two in the after-noon, when the heat of the Sun is too violent, and too quickly conſuming that little moiſture, which is neceſſary for the root. And when it raineth, I cover alſo my Melon-garden, leſt too much wet hurt my fruit. There is ſome ſubjection in this, but 'tis alſo a pleaſure to thrive in working by Rule.

If the root produce too many branches or arms, cut away the weakeſt of them, and leave none but 3. or 4. of the ſtrongeſt and moſt vigorous, and ſuch as have their knots neareſt to one another. When I tranſplant my Melons from the Nurſery-bed, I put commonly two roots together, except I find one very ſtrong, which I then plant alone, cutting from it neither of the branches that ſhoot from each ſide (mark't 7.7.) betwixt the one Ear and the Leaf before ſpoken of. But when I joyn two roots together, I quite cut away both the branches, that ſhoot from the two Ears, ſtanding one over againſt the other, to avoid the diſordering abundance of branches; which alſo would wrong the foot.

The Melons being knit, I leave but *two* of them upon each foot, chuſing thoſe, that are beſt placed, and next to the firſt and principal Stalk, that is, to the heart of the foot. I alſo take care, to leave none but fair ones, and ſuch as have a ſhort and thick tail. The foot alſo of your Melon muſt be ſhort, well truſs'd, and not far diſtant from the ground. Melons of a long ſtem, and having the ſtalk of the Leaf too long and ſlender, are never vigorous, and cannot yield good Melons.

It happens ſometimes, that at the very firſt there ſhoot out from between the two Ears, *two* Leaves, though I above ſpoke but of *one*; but this happens but ſeldom; and when it does, ſuch two leaves muſt be reckon'd but for one knot; and afterwards there will ſhoot out a ſecond, then a third, &c. and ſo on to 25 or 30, if you be not careful to cut in time: And it is at the extremity

tremity of thoſe branches ſo diſtant, that Melons will grow; but they cannot be good, becauſe they are ſo far from the place, which affords them their nouriſhment; and their Juyce is alter'd by the length of its paſſage through the branches, which the Sun ſpoileth; whereas the foot of the Melon being ſhort and well truſs'd, there are always leaves covering the branches and even the Melons themſelves, until they be near ripe.

Too great heat parches them too much to take nouriſhment well; and this you muſt take care of. He that is curious, muſt every day walk often in his Melon-garden, to cut off all the branches, which he ſhall obſerve to be uſeleſs, or hurtful. You'l find of them to ſhoot forth almoſt to the Eye, and they are capable to alter all, if it be not remedied in time.

I muſt not forget to tell you, that from the midſt betwixt the two Ears and the two firſt Leaves there ſhoots out yet one branch more, which ought to be kept, if vigorous, but cut, if weak.

In the *Figure* I have mark'd a Leaf with 5, ſhooting out from the midſt of the fourth knot: I might have mark'd more, coming forth ſucceſſively from one another, as you ſee the fourth come from the third, &c.

We may perhaps the next Moneth *impart to the Reader another Letter from the ſame Generous and Intelligent perſon, upon the ſame Subject.*

An Account of two Books.

I. *Renati Franc. Sluſii* MESOLABUM.

SEU

Duæ mediæ Proportionales inter extremas datas per Circulum & per Infinitas Hyperbolas vel Ellipſes, & per quamlibet exhibitæ.
Ac Problematum omnium Solidorum effectio per eaſdem Curvas.
Acceſſit pars altera de Analyſi, & Miſcellanea. Leodii Eburonum 1668. in thin 4°.

THe *Argument* the Title declares to be the ſame with that in the Geometry of the famous *Des-Cartes*; *viz.* That Ancient Probleme of finding *two Means*, or *Doubling the Cube*, which troubled all *Greece*. The Solution of which Probleme in Geometry may be compared to that with the giving of the *Cube-root* of any Number propoſed in *Arithmetick*: For, in Arithmetick, the firſt of two continual Proportionals between an *Unit* and *any Number* propoſed, is the *Cube-root* of that Number, and the Unit in Arithmetick is repreſented by a Line in Geometry, which is one of the Extreams.

Concerning this Probleme, the *Author* declares himſelf to be none of thoſe, that ſearch for that which cannot be found, to wit, to perform it by *Right Lines* and a *Circle*. 'Tis true indeed, it may be ſo done, to wit, by tryals and profers; as, who cannot in that manner divide an Arch into three Equal parts? But ſuch *Mechaniſmes* are accounted *ageometrick*; and ſuch operations may be well reſembled to the vulgar Rule of *Falſe Poſition* in Arithmetick, which cannot give an abſolute true Reſolution of one of the meaneſt of Queſtions, when the thing ſought is *Multiplex* of it ſelf, or Involved; for inſtance, what Number is that, which multiplyed in it ſelf makes 9; who knoweth it not to be 3? But who can find it to be abſolutely ſo by the aid of the ordinary rules of *Falſe Poſition*, wherein the Extraction of a *Square Root* is not preſcribed?

The Author obſerves, that amongſt thoſe, that ſolve this Probleme by the *Conick Sections*, they ſeem to have afforded fewer Effections thereof, than there have been Ages, ſince it was firſt propoſed. Very few by ayd of a *Circle* and an *Hyperbola* or *Parabola*: by a *Circle* and *Ellipſis* none, that he could obſerve to have been publiſhed.

The which the Author conſidering, and ſtudying how to ſupply, he found out not onely one, but infinite ſuch Effections, and that not in one Method, but many; following the guidance of which Methods, by the like felicity he hath conſtructed all ſolid Problems infinite ways, by a *Circle* and an *Ellipſis* or *Hyperbola*.

1. His general Methods for finding two Means, by a *Circle* and either an *Hyperbola* or *Ellipſis*, are laid down in Prop. 1, 2, 16, and in this 16 Prop. he ſheweth to do it with *any Ellipſis* and *a Circle*.

2. Particular Effections for finding but one or both of the

Means, and Doubling the Cube, in Prop. 3. to 6.

3. And albeit all *Cubick Æquations* may be ſolved, either by the finding of *two Means*, or the *Triſection of an Angle*, yet he ſhews the Extent of his Method, in finding out other Infinite ways for the doing thereof, from Prop. 7. to 12.

4. The *Triſection* of an *Angle* by a *Circle* and *Hyperbola*, Prop. 13. and by a *Parabola* in ſtead thereof, Prop. 15. And the finding of *two Means* by a *Circle* and *Parabola*, Prop. 14.

In the Second part of his Book *De Analyſi*, the Author firſt gives you the *Analyſis* or *Algebra*, whereby all his *General* Methods of finding *two Means* were invented. And afterwards, for the advancement of Geometry, gives you the *Analyſis*, that relates to his *particular* Methods, as in caſe you would find but one of thoſe Means, and afterwards by an eaſie operation the other. After that, he comes to ſhew, how the Effections or Delineations for *Cubick Æquations* were invented; And then, how thoſe Conſtructions for the *Triſection* of an *Angle* were found out: the uſe whereof is, to give Lines in a known meaſure, equal to the quantity's ſought, whereby either to give aid in the eaſie obtaining the firſt and ſecond figures of the root, or controul the ſame.

Laſtly, he comes to treat of *General* Conſtructions for the reſolving of all *ſolid* Problems, without reduction of the Æquations propoſed; and ſheweth a *general* Conſtruction for all *Cubick* and *Bi-quadratick* Æquations by ayd of a *Circle* and a *Parabola*, letting *Ordinates* fall from the points of Interſection on ſome Diameter of the *Parabola* (which is always parallel to the *Axis*,) whereas *Des Chartes* letting thoſe *Ordinates* always fall upon the *Axis*, was forced to prepare and alter the Æquations by driving out or taking away the ſecond term (which is next the higheſt,) that the ſum of the *Negative* roots might be equal to the ſum of the *Affirmative* ones, as his Conſtructions always require.

But how to find out all the variety's of ſolving all *Solid* Problems by the *Conick Sections*, hear the *Author* to the *Reader*: *Methodum non adſcripſi, tum quod gratius ac utilius futurum arbitratus ſum, ſi eam ipſe privato Studio, ex hiſce Speciminibus eliceres, tum etiam quod judicium tuum de tota re præſtolarer, Decrevi enim,* *ſi favor tuus accedat, non ipſam methodum tantum, ſed & alia, quæ ſimul obſervavi, brevi, Deo bene juvante, cenſuræ tuæ ſubmittere.*

We come next to ſpeak of the laſt part of the Book, to wit, his *Miſcellanea*, and becauſe it falls in here ſomewhat properly, we therefore firſt mention his fourth Chap. *De Maximis & Minimis*, from which he derives this Propoſition;

If any Magnitude (or Number, as the whole) be divided into ſuch parts, that are to each other as a Number to a Number, the Product of thoſe powers of the parts, that are of the ſame degree, as the parts themſelves denominate, is the greateſt of all Products of the like powers of the parts of the ſame magnitude when otherwiſe divided.

Concerning the Propoſition the *Author* ſaith thus; *Liceret hujus Propoſitionis Uſum prolixius extendere ad determinandas nempe maximas & minimas applicatarum in Curvis, tangentes, & ſimilia; verum cum hanc materiam nuper in Exercitatione ſua Geometrica feliciter aggreſſus ſit Vir Clariſſimus* Michael Angelus Riccius, *doctrina & humanitate ſingulari, orbi literato notiſſimus, & juſti operis ſpem faciat; fruſtra nunc pluribus inſiſterem, cum meliora & perfectiora ab ipſo propediem expectari debeant.*

That exercitation of *Riccio* hath been lately re-printed for *Moſes Pitts*, Book-ſeller in *Little-Britain*, (and is annexed to *Mercator*'s *Logarithmotechnia*) wherein the *Author Riccio* promiſeth a new Rank of *Conical Solids*, which cut, do exhibit thoſe *Infinite Parabola*'s *and Ellipſes*, whereby all Æquations may be eaſily reſolved and determined. But the Learned and Modeſt *Sluſius* in a *private* Letter concerning theſe matters, and *Riccio*'s before-mention'd *Geometrical Exercitation*, ſaith ſomewhat more. *Diu eſt etiam ex quo eandem materiam aggreſſus fueram, qua Methodo, videbis in* Miſcellaneorum meorum *Cap.* 4. *ubi Propoſitionem univerſalem demonſtarvi, ex qua omnia deduci poſſunt; non tamen deduxi, ne viro amico, qui hanc materiam jam occuparat, & a quo multa ac præclara expectari poſſunt, occaſionem bene merendi de Rep. literaria præriperem.*

Concerning the reſt of the *Miſcellanies*; Our Author in the 1. *Chapt.* treates *De Infinitis Spiralibus, & ſpatiorum, ab iis &*

Radio Circuli comprehenſorum, menſura. Concerning which he tells you, that *Archimedes* ſquared that *Spiral*, which was made by an equal motion both in the *Radius* and *Circumference* of the Circle: that *Stephano Angeli* hath done the like, when the Motion in the *Radius* is equal, but in the *Circumference* according to any degree of Acceleration; which gave him occaſion to render this Doctrine eaſie and Univerſal by reducing it to one *Analyſis*, when the motion is accelerate according to any degree either in the Radius or Circumference; and hence reſolves this Probleme; *In Circulo deſcribere Spiralem ex talibus motibus compoſitum, ut Circulus ad ſpatium Spirale habeat rationem datam numeri ad numerum.* And applies the ſame Doctrine in

Chap.3. to another ſort of *Infinite Spirals.*

Chap. 2 He treats *De menſura ſpatiorum, curva & recta Contentorum, & eorum Centri Æquilibrii*; applying the former *Analyſis* or *Algebraick* Calculation thereto.

Chap. 5. Treats *De Puncto flexus contrarii in Conchoide Nicomedis prima:* which Point he determins by the Interſection of a *Parabola*, whoſe *Axis* is ſituated in the ſame Line with that of the *Conchoid*; or by a *Cubick Parabola*, whoſe *Axis* is parallel to the *Baſe* of the *Conchoid*, and *Vertex* the ſame with the *Pole* of the *Conchoid*; and hence invents innumerable other *Conchoids* of like properties, and finds the Curve, paſsing through thoſe points of flexure, that are made by *Infinite Conchoids*, deſcribed about the ſame common *Pole* and *Baſe*, which in the *Common Conchoids* he finds to be the *Perimeter* of the *Cubick Parabola* here mentioned: But in his own *new Conchoids*, it is the antient *Ciſſoid*, extended beyond a Quadrant and running *Aſymptotick*: And he finds alſo the round Solids made by the Rotation of theſe infinite Curves, and of the *Ciſſoid* Line, about their *Baſe* Lines or *Aſymptotes* equal to finite Solids.

Chap. 6. The Author conſidering, that *Vincenzo Viviani* in his Book *De Maximis & Minimis* found, that if there were innumerable *Parabola's* deſcribed, having the ſame *Axis* and *Vertex* common, if from any point in that *Axis*, the ſhorteſt Lines were drawn to thoſe *Parabola's*, all thoſe points of Incidence would fall in an *Ellipſis*; and the Authors Analyſis taught him, that the *Prop.* was Univerſal, whereſoever the point be aſſigned, from which the leaſt lines are to be drawn; which he hath extended, and applyed to thoſe infinite ſorts of other *Parabola's*.

Chap. 7. Treats *De Figurarum dimenſione ex dato Centro Æquilibrii:* This he ſaith is accurately handled by the Learned already; *Aliquot tamen modos adſcribit, ut non difficiles, ita nec inutiles ad inveſtiganda Æquilibrii Centra:* which may be applyed to good uſe; for, in any Curve, if there be *Ordinates* enough given, ſtanding erect at an equal parallel diſtance, you may approach the *Area*, and if by ayd thereof, you find the Center of Gravity, then do you obtain the meaſure either of the *Round Solid*, or *Spindle* made by the Rotation of the given Figure, or of *Hoofes* raiſed upon it as a Baſe.

Chap. 8. The Author ſheweth an eaſie way of finding the Center of Gravity of an *Hyperbolical Conoid*, and that in order to the reſolution of this Probleme; *Locum invenire, ad quem ſunt omnia Centra Conoidum Hyperbolicarum, quæ fiunt ab Hyperbolis in dato Cono recto ſectis, & quarum Axes ſint Axi ejuſdem Coni paralleli*; which he finds to be an *Hyperbole*.

Chap. 9. He treats of the *Center* of *Gravity* of the *Lunula* of *Hippocrates Chius*, and ſheweth, that if *Hippocrates* had given that, as he did the *Quadrature* of the *Lunula*, he had ſquared the *Circle*.

Chap. 10. Treats of Arithmetical Problems, wherein he aſſerts, that *Diophantus* was wont to ſolve *Arithmetical* Queſtions with great ſubtilty, but uſeth numbers only, whereas the ſame may often be more eaſily and univerſally ſolv'd by *Algebra*; and takes for examples, the third Queſtion of the Fourth Book, which he reformes, and deduceth divers of the like kind, that *Bachet* hath added, to one Propoſition and Reſolution; the 44th of the Fourth Book of the ſame *Diophantus*, which being ſolved with much trouble, he ſheweth to have a briefe *Analyſis*; the 13th of the third Book, and the 36th of the fourth Book, by reaſon of the likeneſs of it's Operation with the former.

Thus we have given an account of the Author's Book. What Repute he hath among the Learned, needs not to be inſiſted on. The famous *Paſchal* or *Dettonvile* in a Letter to this *Author*, ſaith, (to give it in *Engliſh*;) I believe, that to make it known, that 'tis *You*, who hath found (for Example) this *Parabola*, which is the Place, that gives the Dimenſions of the Surfaces of the Solids of the Cycloid about the *Baſe*, it muſt be I, that muſt tell the World ſo; as well as the other Wonders of your *New Analyſis*, and ſo many other things, which you have done me the honor to impart unto me, with that goodneſs you are pleas'd to have for me, *&c.*

The Book here commended is the Second Edition of the *Meſolabe* of this Excellent Geometer, our Author; Concerning whoſe *firſt* Edition thus ſaith *Stephano Angeli* pag. 217. *Acceſſionis ad Stereometriam & Mechanicen.* Quomodo autem *hujuſmodi Problemata Solida conſtruantur, edoctum fuit a quam plurimis; ſed Herculeas metas in infinitum tranſcendit Nobiliſſimus & Clariſſimus Geometra* Renatus Franciſcus Sluſius *Leodienſis, in ſuo admirabili Meſolabo, in quo hæc infinitis enucleat modis.*

Concerning *this* Book, we find it to be the judgement here, (and doubtleſs it will have the ſame eſteem elſewhere among the Learned) that in it there is the moſt excellent Advancement made in this kind of *Geometry*, ſince the famous Mathematician and Philoſopher *Des Cartes*.

II. *Tractatus de CORDE; item de motu & Colore SANGUINIS*, &c.

A. Richardo Lower, *M. D. Londini in* 8o, *impenſis* Jacobi Alleſtry, 1669.

THe Learned Author of this Treatiſe (a Member of the *R. Society*) conſidering with himſelf, how important it was, for the attaining a full knowledge of the Nature and Qualities of the *Blood*, to inveſtigate, beſides the *Circular Motion* thereof, the *Origin* and *Celerity* of that Motion, and the various *Changes* thereof, together with the *Cauſes* of them; as alſo, to make an eſtimate of the Quantity of that Liquor emitted at every Pulſation; thought it very well worth while, to give, from his own beſt Obſervations, a clear and particular account of that whole matter. And for as much as he conceives, that the *Motion* of the *Blood* depends on that of the *Heart*, he begins with a Diſcourſe concerning the *Situation* and *Structure* of the *Heart*, to ſhew, How exactly theſe two are calculated for its Motion, and how well adapted to diſtribute the Blood into the parts of the whole Body.

In the *Firſt Chapter* then, he conſiders the *Diverſity* of the *Situation* of the Heart in *different* Animals, and the Reaſon thereof; proceeding to diſcourſe of the *Pericardium* and its Uſe, together with the Origin and Vſe of the *Serum* therein; and why in *Man* onely that *Caſe* of the *Heart* grows to the Midriff, and what makes it to do ſo; as alſo, why the *Cone* in an *Humane* Heart bends much more to the Left ſide, than in *Brutes:* Then ſhewing, that *Arteries* have their riſe *from* the Heart, but *Veins* terminate *in* it, and how and by what Veſſels the Heart is nouriſht by the Alimentary Juyce: treating alſo of the *Veſſels* of the Heart, its Nerves, and the various Influx of the Animal Spirits through the Nerves into the Heart, according to the various ſhapes of Animals, together with the Cauſe thereof: Proving further, that the ſubſtance of the *Heart* is perfectly *Muſcular,* and in perfection ſurpaſſing all other Muſcles of the Body (where he exſpatiates into un-common Obſervations concerning *Muſcles* in *general*;) then deſcending to a Minute Explication of the parts of the Heart, and there particularly ſhewing the *Mechanical* Contrivance of the Heart for its *Syſtole* and *Diaſtole,* together with an accurate deſcription of the *Foramen Ovale,* and its Vſe in the *Fœtus,* and the Clauſure of the ſame in Animals born.

In the *Second Chapter* he treats of the *Motion* and *Office* of the Heart; Where, as he admits not of any *Ferment* or Ebullition of the Blood in the Heart (which he affirms would be an Obſtacle to its *Syſtole,* as 'tis needleſs to the *Diaſtole,*) ſo he aſſents, that the Motion of the Heart depends not from ſuch an Ebullition (which he proves by Experiments, and vindicates from Objections;) but that the genuine and immediate Inſtruments of the Heart's Motion are its Fibres, Nerves, and Spirits flowing through them, the action of the Heart being altogether conform to that of other Muſcles: Where he takes occaſion to make it out, that the Motion of Muſcles is not caus'd by their being *inflated,* nor by any *Exploſion* of the Spirits paſſing through them, but after the manner, as two men taking one another by their hands, draw themſelves cloſe together into mutual embraces: Whence he goes on to ſhew, That the whole Motion of the Heart conſiſts indeed in the *Syſtole*, that of the *Diaſtole* being onely a *Motion* of *Reſtitution*. Further, that there is a neceſſary Commerce betwixt the *Heart* and *Brain* (the Cauſe of all Senſe and Motion:) but that both ultimately depend from the *Stomack*, as the conſtant *Purveyor* and Furniſher of Matter for Bloud and Spirits.

In the *Third Chapt.* he teacheth, with what *Celerity* all the Bloud paſſeth through the Heart, and what *difference* there is between the *Venal* Bloud and the *Arterial*. As to the *former*, he calculateth, that all the Bloud paſſeth through the Body, thirteen times, (not *Six*, as 'tis miſprinted in the Book it ſelf) in *one* hour. And concerning the *latter*, he is of opinion, that the *Purpureous* and florid color of the Blood in the Arteries proceeds not from its *Accenſion* in the Heart (if there be any ſuch thing) but depends altogether from the *Lungs*, and the *Admixture* of the *Air* with the *Bloud* there: which he proveth by conſiderable Experiments; refuting withal the opinion of thoſe that will derive it from the *Comminution* of the Bloud in the Lungs.

In the *Fourth Chapt.* he gives an Accompt of the Riſe, Progreſs and Uſe of the Invention of *Transfuſing* Bloud out of one Animal into another: though in the Hiſtory of this particular he commits (I know not by what over-ſight) a miſtake, in relating, that *Monſieur Denys* (call'd by him *Dionyſius*) arrogateth to *himſelf* that Invention, whereas he onely tells us that ſome of his Nation do ſo. Beſides which, we muſt needs take notice of another miſtake in this part of the Book, *viz.* that the Author taking occaſion to ſpeak of the *Philoſ. Tranſactions*, calls them the Tranſactions of the *Society*; which certainly he would not have done, if he had either but taken notice of what is ſaid in *Numb.* 11. of the ſame; or elſe conſider'd, that ſo Illuſtrious and ſo Learn'd a Body would certainly, if they thought fit to publiſh any thing as theirs, entertain the knowing World both with ſublimer Matter, and with a ſutable Eloquence: But this *by the by.*

In the *Fifth Chapt.* he treats of the *Chyle*, and its Change into Bloud; where he obſerveth, that nothing paſſes from the *Spleen* through the *Vas breve* into the *ſtomack*; but that the *Ferment* of the ſtomack proceeds immediately from the Blood it ſelf: Explaining further, How the *Separation* of the *Chyle* is perform'd in the *Inteſtins*, and how the ſame, to facilitate the more its paſſage, is diluted and refined by the Iuyce of the *Pancreas*, ſecreted into the *Duodenum*: Rendring alſo the Cauſe, Why all the *Glanduls* in the *Abdomen* and in all the lower parts of the Body do depoſite their *Lympha* or Juyce into the Common great *Receptacle* of the *Chyle*, and Why that Receptacle is plac'd between the *Tendons* of the *Daphragime*; as alſo, Why thoſe Channels, which convey the Chyle into the *Subclavial* Vein, are double. To which he adds, That all the Chyle is by the *Ductus Thoracicus* alone tranſmitted into the Bloud and Heart, which he proveth by ſeveral conſiderable Experiments, with ſome reflexion on the *Bilſian* Experiment alledged for the contrary. All which he concludes by ſhewing the degrees and ways of Change, whereby the Chyle is at laſt converted into Bloud; and how it ſerveth for the *Nouriſhment* and the ſeveral parts of the Body.

The Whole receives a ſingular Elucidation and Ornament by the Accurate *Figures*, in 6. *Tables* annexed.

Many Curious and important Obſervations are occaſionally interſperſed; ſuch as are: That the Capillary veſſels (of the ſame ſort) do open into one another in all the parts of the Body: That all the Muſcles of the Body, are *Biventers* or double-belly'd: That as the Motion of the Heart and Bloud is Circular, ſo the Fibres, as the Moving *Engines* of them, are about the *Cone* of the Heart brought into a Circle and Center: That the Motion in the Muſcles is not like *Shooting*, but *Fencing*; and many more, for which we muſt referr to the Book it ſelf.

FINIS.

LONDON,
Printed by *T. N.* for *John Martyn*, Printer to the *Royal Society*, and are
to be ſold at the *Bell* a little without *Temple-Bar*, 1668.

PHILOSOPHICAL TRANSACTIONS.

April 12. 1669.

The Contents.

Promiſcuous Additions to what was formerly publiſh't concerning Vegetation. *Some inſtances, ſhewing the Correſpondence of the* Pith *and* Timber *with the* Seed *of the Plant; as alſo of the* Bark *or Sap in the Bark with the* Pulp *of the Fruit. An Extract of a Letter, giving further directions about* Melons. *A ſummary account of the* Rules of Motion, *by M.* Hugens. *A narrative concerning the Reſolution of Æ*quations *in* Numbers, *by M.* John Collins. *An Account of two Books,* I. PRÆLUDIA BOTANICA Roberti Moriſon, *M. D.* II. CL. SALMASII Præfatio in librum de HOMONYMIS HYLES JATRICÆ: Ejuſdem de PLINIO IUDICIUM. Divione, *A.* 1668. *in quarto.*

Promiſcuous additions, made by Dr. Tong, *to what was communicated by the ſame in* Numb. 43. *and* 44. *concerning Vegetation.*

1. FOR perfecting the experiment of *Sap*, and to find out, whether it aſcends more or leſs in the prict't Circles of the Body, then in thoſe betwixt the Body and Bark; let the tree, exempted from all its ſap the day before, be firſt peirced with an Auger, only through the Bark, and the quantity of Sap it yeilds, exactly meaſured and weighed: Then at the ſame time let alſo another hole be bored into the

Body of the tree about 1½ inch deep, and ſo round, on every ſide of the ſame tree, and of others of the ſame ſort, (all exhauſted of their ſap the day before) ſome deeper and ſome ſhallower, with a good large Auger; and one quite through, ſloaping. From this experiment, after divers and various trials, may be found the difference of the Sap riſing on the North and South in Sun and ſhade, and ſo likewiſe from that which comes from the Bark, and that which aſcends in the inner part of the tree. The weight alſo may be compared of that, which iſſues from the Bark, with that which iſſues from the Body. The internall heart-ſap may alſo be drawn apart, by boring a *Smaller* auger-hole in the midle of a *Greater*, and fitting it with a long pipe adjuſted into the inner orifice. If no difference be found in theſe, by diſtillation after fermentation, nor otherwiſe, the preſumption will be greater, that the difference of *Heart* (as when they call *Heart* of *Oak*) and Sap in Timber is not from the plenty or ſcarcity of ſap, but from the ſeaſon of felling.

2. From the obſervation of the woody Circle or pricks in the Branch, Arm or Body of a tree, it may be inquired, whether at ſuch time when that Circle firſt encompaſſ'd next the bark, the tree be or be not more ſubject to corruption, than at another ſeaſon, when the jelly of the juyce is grown more condenſed? I am inform'd by a curious and intelligent perſon, that the corruption of the Timber depends not upon the time of the year, and the aſcent, or the plenty or ſcarcity of Sap ſo much, as upon the ſeaſon of the Moon or Wind. And he affirms, that Timber-trees fell'd, when the wind is in the Weſt, eſpecially in the Old Moon, will keep them free from grubs (as they call it) *i.e.* from being worm-eaten; and on the contrary, that when cut down in an *Eaſt* winde, the worm will ſeize on them, in what ſeaſon of the Moon ſoever it be fell'd: To prevent which corruption, 'tis adviſed, that ſuch timber ſhould be forthwith thrown into water. It's indeed worth inquiring, whether we may not aſcribe ſomthing of the durableneſs of timber to the perfect condenſation of the outward integument or coat, and ſo take care, that when trees are to be fell'd for timber or other durable materials, the outward coates may be of ſolid wood.

3. *Ethelbert Jay*, an ingenious and expert planter in *Lemſter*, ſuppoſeth, that the fitteſt time to inoculate is preſently after mid-ſummer, becauſe (*ſaith he*) the Sap deſcends; but I ſay, becauſe 'tis then moſt plentiful, and begins to jelly. The ſame adſcribes it to the ſap aſcending, to take the bud inoculated *before* mid-ſummer; and to the Sap deſcending, to take it *after* mid-ſummer. The time he limits to a few days before mid-ſummer, and to 8. or 10. dayes after it. Mr. *Auſtin* limits 14 dayes before, and as many after; and would have the bud unty'd after 14. days, as I remember.

4. It is all one, whether the Sap be exhauſted below, by being converted into wood, roots, or other uſes; or by diverſion, as when the branch is cut, or the bark opened below: The Sap in both caſes deſcends or rather ſinks indifferently to ſupply the defect, and heal the wound; and ſo it coms to paſs, that there being about mid-ſummer the greateſt plenty of ſap in apple-trees, a bud then inoculated will thrive, eſpecially before mid-ſummer; for then it drawes its ſhare in the Sap aſcending, and, all the neceſſary uſes of the upper branches being ſerv'd, it partakes of the flood of the abounding and ſuperfluous Sap, remitted to it from them.

5. Hence I conclude, that to gird a tree at a convenient diſtance above the inoculated bud before mid-ſummer (ſo as is practiſed to ſtay the bleeding of Vines, to gird them below) is an experiment worth trying; that we may know, whether it will cauſe a ſtronger ſhoot of an inoculated bud or no? Or whether it be better, to cut off the head of the ſtock above the inoculated bud; which my friend informes me will make a better ſhoot, than in the uſual inoculation, if this be done a few dayes before mid-ſummer. Further, when you gird, it muſt be tryed in ſeveral trees, whether girding long before mid-ſummer will not ſtay the aſcent of the ſap, and cutting of the head, much more? Whereby time may be gained by retarding the ſeaſon of inoculation, to their benefit, who have very many to inoculate; and in wet ſeaſon to ſtay for dry weather, onely fit for this work.

6. If then the Sap in it's ſubſiding be ſo conſiderable in the matter of inoculation, it ſeems, that inoculation will hold beſt

and

and longeſt in ſeaſon in the Root. For I have obſerved the Sap to ſubſide unto the Roots out of the Body at ſuch times of the day and year, when in the Branches I found none to ſpare.

7. If Binding, or Cutting off the Head advances the ſhoot of the inoculated bud, then it ought to be experimented, Whether diſbarking a few days before Midſummer on the contrarie ſide, a little below the bud, and having wax apply'd or clay on the part disbark'd, may not by that direction of the Sap, neceſſitating it to paſs by the bud, further its growth conſiderably; or, which is better, a gaſh cut in the wood in that place.

8. To make a barren Tree beare again, cheriſh, dung in trenches, and pare and renew the extremity's of its longeſt Roots, and cut off the outermoſt and ſhorteſt, neareſt the Body. Hence it may ſeem, that Plowing helps Fruit-trees.

9. Croſſe hackings promote fruitfulneſs, cure the *Phyllomania*, whereof the reaſon ſeems to be, that (as was above intimated) Outward Circles and Bark feed the Wood, and the Inner onely reach out to the uttermoſt ſpriggs of the laſt year, to which the Fruit is appendant. For, ſome Trees bear only on this years ſhoot, and ſome only on that of the laſt, poſſibly ſome only on the third years ſhoot; and ceaſe bearing, when they ſhoot no new ſpriggs. Seaſonable baring the Roots, which they call *Ablaqueation*, probably hath the ſame effect, becauſe it hinders the nouriſhment eſpecially of the outward coates, and of barke, leaves, and ſuckers: But, becauſe it ſeems, that, as ſome ſuckers or ſhoots, lately ſprung in outward coats, robb the fruit of the riſen Iuyce, ſo later roots, come from the outward parts of the maine roots, rob them alſo of their firſt nouriſhment in the earth; they ought to be pruned, as well as all ſuckers and not-bearing branches and ſpriggs, every year. For which reaſon alſo, the better to increaſe and amend fruit, it may be obſerved, what was recommended above to the 15th *Querie*, viz. The applying of dung and other amendments in trenches nigh to and beyond the fartheſt points of the Roots, to draw them out of the ſhade and drops. To this end, Diſtance and ſituation is to be obſerved.

10. One of the beſt ways of obtaining the greateſt ſtore of Sap in the ſhorteſt time from the Body of any Tree, is, Not only to pierce the Bark, nor to cut the Body with a chizel, almoſt to the Pith, (as ſome have directed,) but quite thorow all the Circles and the inner Rind it ſelf, on both ſides of the Pith, leaving only the outermoſt Circle and the Bark on the North-Eaſt-ſide unpierced. But this hole is to be bored ſloaping upwards, as large as the biggeſt Auger, you can get, will make; and that alſo thorough and under a large Arm near the ground. So will it not need any ſtone to keep open the orifice; nor Spigot, to direct the Sap into the Receiver. This way, the Tree will in ſhort time afford liquor enough to brew with it. And with ſome of theſe ſweet Saps one buſhell of Malt will make as good Ale, as four buſhels with ordinary water, though you ſhould brew even in *March*, held the propereſt time for brewing in regard of the goodneſs of the water at that ſeaſon. *Sycamore* I take to yeild the beſt brewing Sap; being very ſweet and wholeſom.

11. To preſerve Sap in the beſt condition, for Brewing; what you gather firſt, muſt be inſolated by a conſtant expoſure of it to the Sun in Glaſſes or other fit veſſels, till the reſt be gather'd and ready; otherwiſe it will ſoon contract an acidity. Having been thus expoſ'd to the Sun, till a ſufficient quantity is collected; put into it ſo much very thin cut and hard toſted but no ways burnt Ry-bread, as will ſerve to ferment it; and when it works, take out the Bread, and botle the liquor, ſtopping it up with waxed Corks. If you bake *Sage* or any other Medicinal herbs in ſuch thin Ry-paſte, till they be very dry, you may expect a very wholeſome drink. If you put a few *Cloves* in every Glaſs, into which the Sap runs from the Tree, it will certainly keep a twelfmonth. But I have wonder'd, whileſt I obſerv'd, How ſpeedily it drew the taſt and tincture of the Clove. In ſome few bottles I was ſo happy as to draw out my Cloves, with a cloth, in which I tyed them up, in ſuch a ſeaſon, as not to change colour nor taſte; and yet I preſerv'd the Birch-ſap by that ſlight fermentation above a twelf month without any alteration, which elſe would have ſowr'd in a few days.

12. Some propoſe *Oyle* of *Sulphur* to perfume the Bottles with. I know not, whether that alter the taſt, or onely ſtay the naturall fermentation; or what other change it gives the Sap.

13. *Spirit* of *Wine* ferments the Iuyce of ſome Berries, and poſſibly may not only preſerve but advance the vertue of Saps; a little being powred on the top of them in the botles; or ſome other Oily Spirit.

14. *Raiſins* infuſed in the liquor of *Birch*, is one Ingredient of the *Durham-Gardner.* I have been inform'd, that he uſes *Sugar*; but I beleive, he puts it not in, till he opens a Botle, preſently to be drunk, becauſe it maketh the liquor ſparkle in the Glaſſe.

15. A certain Lady ferments it with Ry-toſt, not put in but only hung over it, in ſuch quantity and at ſuch diſtance, as may give ſome light warmth, motion and alteration to the ſurface of the liquor.

16. I fermented ſome with Ale-barm, which converted my delicat *Birch-Iuyce*, kept in Bottles, into pitifull ſmall beer, which I wondred at; for I know one, who uſed by the barm of Ale to *improve* ſmal Beer, and thereby to keep it the better in Veſſels.

17. I perſuade my ſelf, that *Birch-water* fermented by the *Flemiſh Wheat*-ferment, without any barm, would in time be excellently matur'd in Bottles; but not in a ſmall time.

18. Let *Cynamon* alſo be try'd among the Ferments of theſe Iuyces. *Hony* will not mixe with *Cyder* though boyl'd therein to make Meath; but after a while the Cyder lets fall the Hony, and becomes ſimple Cyder again; Q. Whether it will not be ſo alſo in *Birch-ſap?*

19. Some affirm, that the Tops and Leaves of Birch, decocted in the Sap, will preſerve it from Sowring the whole year; and that any ſort of dry'd Aromatick herbs, as *Sage &c.* boyled in beer, will keep it as well as *Hops*, *Ling* (*Heath*) *Broom*, or Worm-wood. I had a friend, who uſ'd *Bay-leaves* in his Beer and Ale. Theſe things I propoſe to tryall, with *green* leaves and tops of *the ſame* year; decoct and *dry* leaves and herbs, infuſ'd or boyl'd, of *former.* The inner Bark yields Oyle, and probably, when infuſ'd, will preſerve Iuyces. So you have Oyle, Vinegar, and Wine from our own native Trees.

20. Delicate and light *French* Manchet, toſted, may poſſibly be alſo good for our Sapps.

21. For the clearing of what was delivered *Num.* 43. p. 858. about *prickt Circles* in Trees, it may be added, That thoſe *Circles* are ſuppoſ'd to be at ſome time of the year of one ſingle row of *pricks*, and at ſome ſeaſon, of more, and at others, of ſolid wood. *Quere*, 1. What alteration is found in Circles of *Pricks*, or *Wood*, in Spring, at Midſummer, and in Autumn *&c*? 2. Whether theſe ſingle or double Circles of pricks and coats of Ielly or wood, increaſe betwixt the inner and outward bark, or not? Or, betwixt the one and both of the barks, *i. e.* on one or both ſides of the inner bark? I conceive, it doth on both ſides of the inner bark, ſo that in ſome thick outward *Barks* thoſe Circles may be obſerv'd, as in *Wood*. 3. Whether the Tree receives increaſe in all its inner coats, ſo as every coat yearly grows thicker, or in the outtermoſt only, or in ſome of the outward coats alſo?

Dr. Iohn Beals *Inſtances*

Promiſed in Numb. 42. *and intended to ſhew the Correſpondence of the* Pith *and* Timber, *with the* Seed *of the Plant*; *and that of the* Bark *or Sap in the bark, with the* Pulp *of the Fruit, or ſome encompaſſing* Coat, *or Cod, containing the Seed.*

The Author having prefaced, that he can promiſe no Method in the following Communications, gives theſe Inſtances.

Firſt, *ſaith he*, I had an excellent *Summer-Apple*, containing abundance of very pleaſing Iuyce. It was of that kind, which never grows large. The Body by the burthen of the fruit always wreath'd towards the ground; the Branches all curl'd, and full of knots at every turning; and theſe branches apt to grow, if a good knot be ſet in the ground, aſſoon as 'tis cut off, eſpecially about *Candel-maſſe*. This Tree was hollow, and very near all the Timber extremely rotten from the top of the Stem to the root; and every ſprigg, how ſmall however, appear'd Cork-color'd and rotten at the heart of the Timber. And ſo it was generally all over the Roots; and 'tis like, it had been ſo many years before: Yet the Tree bore abundantly with alternative reſts every ſecond or third year. The fruit had ſcarce any core; the kernels were very ſmall, thin and emptie; neverthele ſſe the branches from the knots grew well enough to repleniſh a Nurſery for me. This ſeems to indicate the Correſpondence between the Pithy part, Heart or Timber, and the Seeds. And more to confirme this; A young tree grew like a Sucker from the only ſound Root of the aforeſaid Apple-tree. This tree grew ſtraiter then others of the ſame kinde uſually do; of which I conceive the cauſe to be this: Suckers are commonly barren a pretty long time; and this continued barren, til the ſtem was ſtrong enough to bear the fruit which loaded the branches. But that, which makes to our purpoſe, is this; All the fruit of this young tree had ful and ſound Kernels; and though it was the ſame fruit, growing from the Root of the ſame tree; yet it ſeem'd not altogether ſo tender, delicious and juycy, as the fruit of the old tree; nor yet was the tree ſo fruitfull. The Sap in the old tree was leſs diverted, it ſeems, to ſuſtaine the life of the timber, which was now conſumed; and thereby was wholy appropriated for the leaf, bloſſom, and the pulp of the fruit. For I do not undertake, that the Sap yeilds no relief to ſuſtain the life and growth of the timber *ordinarily*, and whilſt the timber is entire; but I rather conceive, that there is a more immediate and peculiar relation between the Sap and Pulpous fruit, and the like between the Timber or whole ſtock, and the Root of the Tree, to tranſmit the ſame ſpirit and nature to the Seed of what kind ſoever it be.

Some are of opinion, that there paſſes into the Timber no part of meer Earth to ſuſtain the life and growth of the Plant, but it only feeds on the ſucculent part aſcending by the Roots, and on the Air, and the moiſture, which the Dews of Heaven, the Rainy ſeaſons, and the Air afford. And if we conſider, that ſome lofty trees grow upon the Rocks, where little or no earth can be found; as alſo, how largly the Oak and Pear-tree grows and ſpreads, and how many years the one bears Acorns, the other Pears, ſomtimes to the quantity of yeilding 5. or 6. hogsheads yearly (as I have known them do;) and in compariſon how little waſt of Earth about the roots appears; we may find more cauſe to attribute this large expence of materials to the perpetual ſupply of Moiſture, than of much Earth. I will give you an experiment, which may ſeem to determine the point, though I yet ſuſpend my Judgment.

took the largeſt of *Kentiſh* Codlins, Pearmains, Pepins and Deuxans; I wither'd them (which may be ſoon done many ways;) and then I cut them in the midle quite through the midſt of the kernels, having carried them ſome dayes in my pocquet: all that ſaw them, took them to be very wood, and they were indeed like very cloſe Cork. And ſome Philoſophical perſons (though I affirm'd no falſhood, but concea'd the whole matter) did upon the view ſpread it abroad, that I had the *Art* of *converting* all *Fruit* into Wood; pulp and kernels and all was wood. The ſame may be done upon Pears, Cowcumbers, Turnips, and all the Grains and Vegetable Seeds, that are ſtuck in them, and are cheriſh'd by a ſupply of Marly Water. Thus I have had the blades of Wheat and the helme of Peaſe grow out of them to the length of a foot, and then by hanging it in a cloſet, all becoms turn'd into wood; and in ſome time after, all is turnd into Duſt and Earth. And as we are well taught by Maſter *Boyle*, that pure Liquids may be converted into Earth; ſo theſe Terreſtrial parts of the Fruit may be from the Liquors thither collected, and derived from the Maſs of the Earth.

But to return to the clearing of the affinities above claimed; I Inſtance in *Berbery* roots, perforated by me, which bore Berries, that had no ſtones at all: And in hollow'd Apple-trees the kernels will be very thin, and empty ſkins, and uncapable of growth. Gardeners tell me, that if you take the hard ſtick out of the root of Parſly, it will bear no kind ſeed. But it may be objected, that a very hollow *Oak* and an hollow *Elme* doe bear pregnant ſeed. I anſwer, that an *Elme* is all Timber to the Bark; and an *Oak*, when 'tis all putrid at the heart, yet may have firm wood enough to convey the Spirit of the root into the Acorn; and the Roots may be ſound, when the Body of the Tree is much decayed by rain, beating in at the lopp'd tops, or by other paſſages through the Bark. We ſee, that *Beans*, *Wheat*, and other Grain grow kindly, if the Eyes and parts next adjoyning be whole, though the *Beans* be full of great holes in other parts, or the main body of the *Wheat* be cut off with Sciſſers.

However, let the objection give us the more Caution, that, if we deſſein to a Fruit without Stones, the perforation may be the bolder and the more compleat.

And to proceed further, ſome Trees are leſſe fruitfull, or altogether barren by the exceſſive growth and firmneſs of the Timber; and theſe are recover'd by croſs deep hackings through the Bark: And ſuch injuries done to the Timber both in the Stem and main Roots, they cleave the Roots, and put a ſtone in the cleft, that it may not cloſe again too haſtily. If this violence be not done both to the Stem and Roots, the remedy may fail. We ſee alſo, that *Vines* are leſs fruitful, when they are permitted to run out into many woody branches.

II. To ſhew alſo the Proximity between the *Sap* of the *Bark* and the *Pulp* of the *Fruit*; I did in Summer-time make Reſts for water on the body of *Kentiſh* Codlin-trees, and cauſ'd water to be frequently powred into thoſe Cavities. The effect was this, the Apples grew to an extraordinary bigneſs, and were very inſipid, and many of them had parts in appearance much like the pulp of *Lemons*: ſome I ſuffered to hang on the Tree as long as they would, and thoſe became full of Spots of the Colour of Corke, or like the rotteneſs of an Apple.

I omit the reſt, and haſten to redouble a remark of the great uſe, which may be made of the cheif Experiment. The *Graft* carries the maſtery from the *Stock* for the *Pulp* of the fruit; So that we have little hope of much change by *meer* Graftings, how oft ſoever iterated. But if after many, and ſtrange, and choice Engraftings you ſet the Kernel, Stone, or Seed of the grafted Fruit in a Kind Mould, you may then expect ſome new or mingled kinde of Plant, as *Semi-Apricocks*, &c. And thus the *Almond* and *Peach* may by many changes in the Graftings, and by Inteneration of the Stones of the Peaches, and of the Shels of the Almonds, and by Terebrations of the Stem and Root here and there, alter their guiſes, ſo that the Coat of the Almond may approach to the Pulp of the Peach, and the kernel of a Peach be enlarged to a kinde of Almond; and great ſtore of better contrivances may from hence take riſe.

Extract of a Letter

Of M. dela Quintinie, *giving ſome further directions and obſervations about* Melons; *promiſed in a manner in the* Number *next fore-going*

901

MY great care this laſt Month* hath been, altogether to remove the ſmal feeble branches (on which 'tis not likely that *any* or *any good* fruit will grow) and to leave none but good branches. When-ever you have a Melon, which coms well, knit on a branch, you muſt not fail to cut away the reſt of that branch, on this ſide of the fruit, to the end that all the nouriſhment, that would have been diſperſed into the whole branch, may paſs into that fruit, which is found at the extremity of the branch; taking care notwithſtanding, that the fruit be covered by ſome leavs of the other branches, for its better growth under the ſhade, in thoſe parts where 'tis very hot.

As to the time of the maturity of Melons, I muſt tel you, that I ſhould have begun to eat ſome, 8. or 10. dayes agoe; but that the Seaſon hath been very unkind for 3. months together, a North-winde having reigned all that time, and reigning ſtill, and cauſing cold nights; inſomuch that I have not yet remov'd my Glaſs-bells from them, which elſe I had done 3. weeks agoe. I had knitted ones ſince the end of *April*, ſo that, there commonly needing no more than 40. days from the time of a Melons knitting to that of its ripeneſs, I ſhould have eat of them before this time. But to tel you the truth, I have the advantage of having Melons knit, 3. weeks ſooner, than any body, I know, in this Country.

For the keeping of the Seed, you muſt take no other Seed, but ſuch, as is found in that part of the Melon, which hath been towards the Sun: And at the ſame time you eat the Melons, you muſt well cleanſe ſuch Seeds, and rub them with a linnen cloth, until they be very clean and dry; then putting them up in ſome convenient Cloſet till Seed-time.

Remember, not to eat the Melons but ſome 24. hours after they have been gather'd; putting them in the mean time in a place, neither too hot nor too cold, and free from any dry ſcents, good or ill.

---

* *This letter was written June 15th. St. Nov. in Paris.*

Otbſerve alſo, to gather them ſeaſonably, when they are neither too ripe nor too green: which you may know by their Yellowiſh Colour, and by their Taile, commonly ſplitting, and their Smel. A Melon ordinarily requireth one day from the time of its being ſmitten, to that of its being gather'd. I call the time of its being ſmitten, when it begins to ſhew its being ripe by a little Yellowneſs, appearing in ſome part or other of it. This will oblige you, (as I alſo admoniſhed in my former) to walk through the Melon-garden 2, or 3. times a day, mornings, at noon, and in the evening.

A Melon, that ripens too faſt, is never good, ſuch a ripeneſs not being a good one, but proceeding from the poorneſs or ſickneſs of the foot, which maketh it thus turn ſuddenly.

The Melon muſt be full, without any vacuity, which, you know, is diſcern'd by knocking upon it. And the meat muſt be dry, no water running out; only a little dew is to appear, iſſuing out of the Pulp; which muſt be of a very *Vermilion* Colour.

Trouble not your ſelf to have *big* Melons, but *good* ones. Thoſe who covet great Melons, may have their deſires either by ſowing Seeds of the great kinds, or by much watering others: Which watering is a thing, wherein great care and diſcretion is to be uſed. As I have hitherto kept my Glaſſes over my Melons, yet ſo that within this month they are raiſed from the ground to the height of 4. inches, ſupported by ſmal forks; ſo I ſeldom water them, and but little at a time; which is once every Week. In ſhort, you muſt Judge of the neceſſity of watering by the Vigour, which is required in the foot and leaves, without which the fruit cannot be good for want of good nouriſhment.

A Summary Account of the Laws *of* Motion, *communicated by Mr.* Chriſtian Hugens *in a Letter to the* R. Society, *and ſince printed in* French *in the* Iournal des Scavans *of March 18. 1669. ſt. n.*

BEfore theſe *Rules* of *Motion* be here deliver'd, 'tis neceſſary to preface ſomething, whereby the worthy Author of them may receive what is unqueſtionably due to him, yet without derogating from others, with whom in ſubſtance he agreeth. But, foraſmuch as this Subject is of that nature, that all Philoſophy and generally all Learn'd men are therein concern'd, it will be moſt proper, to publiſh theſe *Rules*, as well as we did thoſe of D. *Wallis* and D. *Wren* (Numb. 43.) in the Language of the Learn'd, together with ſome Hiſtoricall paſſages relating thereto: Which we nowdoe, as follows.

C*Um noviſſimis menſibus nonnulli e* Societate Regia *in publico ejuſdem Conſeſſu enixius urgerent, ut graviſſimum illud de* Regulis Motus *Argumentum, non ſemel inter Ipſos antehac agitatum, ſed, pluribus aliis intercurrentibus rebus, nunquam, uti par erat, diſcuſſum expenſumve, tandem aliquando Examini rigido ſubjectum conficeretur; Viſum equidem fuit Illuſtriſſimo iſti Cætui decernere, ut quotquot e Sociis ſuis indagandæ* Motus *indoli præ cæteris incubuiſſent, rogarentur, ut ſua in rem illam Meditata et Inventa depromere, ſimul et ea, quæ ab aliis Viris præcellentibus,* Galilæo *puta,* Carteſio, Honorato Fabri, Ioachimo Iungio, Petro Borrelli, *aliiſque, de argumento iſto fuerant excogitata, congerere & procurare vellent; eo ſcil. fine, ut conſultis hoc pacto collatisque omnium ſententiis, illa dehinc Theoria, quæ cum Obſervationibus et Experimentis, debitâ cura et fide crebro peractis, quam maxime congrueret, Civitate philoſophica ſuo Iure donaretur.*

Edito hoc celeuſmate, incitati protinus e dicta Societate fuerant, inprimis Chriſtianus Hugenius, Iohannes Walliſius, Chriſtophorus Wrennus, *ut ſuas de* Motu *Hypotheſes et Regulas, quibus condendis aliquamdiu inſudaſſent, maturare atque expe-*

dirent

dire ſatagerent. Factum hinc, ut ſelectus ille Virorum præſtantiſſimorum Trias, poſt paucarum ſeptimanarum ſpatium, Theorias ſuas, eleganter compendifactas, tantum non certatim tranſmitterent, Regiæque Societatis ſuper iis ſententiam exquirerent. Primus omnium D. Walliſius, ſua de Motibus æſtimandis Principia, literis d. 15. Novemb. 1668. datis, ejuſdemque menſis die 29. traditis et prælectis, communicavit. Mox eum excepit D. Chriſtophorus Wren, qui Naturæ Legem de Colliſione Corporum, proximo menſe Decembri, ejuſque die 17. eidem Societati publice exhiberi curavit: quæ in mandatis mox dedit (præ-habito tamen utriuſque hujus Authoris conſenſu) ut ad commodiorem horum Scriptorum communicationem, diſcuſſionemque diffuſiorem, res tota typis mandaretur.

Hæc dum apud Nos geruntur, Ecce adfert Nobis tabellarius d. 4. Ianuarij inſequentis (St. Angl.) Dn. Hugenii literas, ejuſdem Menſis d. 5. (at ſt. nov.) exaratas, ejuſque Scripti, de Motu Corporum ex mutuo impulſu, priores Regulas quatuor, una cum demonſtrationibus, continentes. Habebam ego in promptu Theoriæ Wrennianæ Apographum, idque actutum eodem plane die, ſic favente Tabellione publico, D. Hugenio, redhoſtimenti vice, remittebam, dilata interim literarum Hugenianarum (quibus tale quid includi, ob molem, et antegreſſum Authoris promiſſum, ſuſpicabar) reſignatione, donec ferret occaſio Nobiliſſimum et Sapientiſſimum Regiæ Societatis Præſidem, Dn. Vice-Comitem Brouncker, compellandi. Quo facto, amborumque Regulis in modo dicta Societate collatis, mirus confeſtim in utroque conſenſus effulſit; id quod inſignem in nobis lubentiam pariebat, utrumque hoc Scriptum prælo noſtro committendi. Nihil hic nobis deerat a parte Hugenii, quam ejus conſenſus; abſque quo fas nequaquam judicabamus, ipſius Inventum, maxime cum illud haud integrum eo tempore nobis dediſſet, in lucem emittere. Curæ interim nobis erat, ſcriptum Ipſius publicis Regiæ Societatis monumentis inſerendi; ſimul & Authori d. 11. Januar. ſolennes pro cordata illa communicatione gratias reponendi; additâ dehinc (die ſcil. 4. Februarij) ſollicitâ commonefactione, ut ſuam hanc Theoriam vel Pariſiis (quod proclive erat factu in Eruditorum, ut vocant, Diario) vel hic Londini in Adverſariis Philoſophicis, imprimendam curaret, vel ſaltem permitteret. Quibus expeditis litteris *paulo poſt ſecundas accepimus ab* Hugenio, *ſcripti* Wienniani *de hoc argumento recte traditi mentionem facientes, nil tamen quicquam de ſuimet ſcripti Editione, vel* Pariſiis *vel* Londini *paranda, commemorantes.*

Unde liquere omnino autumem, ipſum ſibi defuiſſe Hugenium *in illa publicatione maturanda; quin imo occaſionem dediſſe procraſtinando, ut laudatus Dn.* Wren, *pro ingenii ſui ſagacitate geminam omnino Theoriam eruens, in gloriæ, huic Speculationi debitæ, partem jure veniret; cum extra omne ſit dubium, neutrum horum Theoriæ illius quicquam, priusquam Scripta eorum ſimul comparerent, reſciviſſe ab altero, ſed utrumque, propriâ ingenii fœcunditate, pulchellam hanc ſobolem enixum fuiſſe.*

Solvit equidem Hugenius, *ante aliquot jam annos,* Londini *cum ageret, illos de* Motu *Caſus qui ipſi tunc proponebantur; luculento ſane argumento, eum jam tum exploratas habuiſſe Regulas, quarum id evidentiâ præſtaret. At non affirmabit ipſe, cuiquam ſe* Anglorum *ſuæ Theoriæ quicquam aperuiſſe; quin fateri tenetur, ſe ab eorum nonnullis ad communicationem ejus ſollicitatum, nec tamen unquam, niſi nuperrime, ad id faciendum pertractum fuiſſe.*

His itaque veritati et Iuſtitiæ litatis, ipſas jam Hugenii *Regulas ſermone* Latino, *in ampliorem Eruditorum uſum, ſic donamus.*

Regulæ de Motu Corporum ex mutuo impulſu.

1. *Si Corpori quieſcenti duro aliud æquale Corpus durum occurrat, poſt contactum hoc quidem quieſcet, quieſcenti vero acquiretur eadem quæ fuit in Impellente celeritas.*

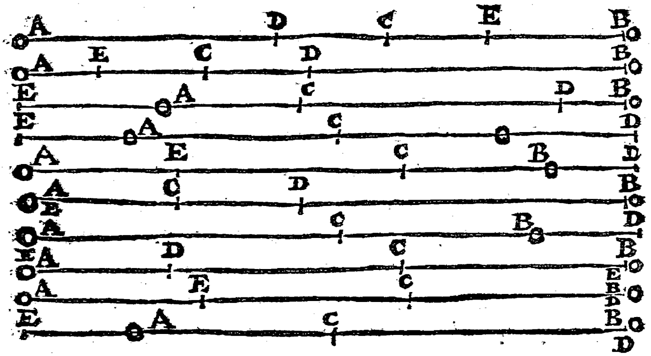
2. *At ſi alterum illud Corpus æquale etiam moveatur, feraturque in eadem linea recta, poſt contactum permutatis invicem celeritatibus ferentur.*

3. *Corpus quamlibet magnum à corpore quamlibet exiguo et qualicunque celeritate impacto movetur.*

4. *Regula generalis determinandi motum, quem corpora dura per occurſum ſuum directum acquirunt, hæc eſt:*

Sint Corpora A et B, quorum A moveatur celeritate A D, B vero ipſi occurrat, vel in eandem partem moveatur celeritate

B D, vel denique quieſcat, hoc eſt, cadat in hoc caſu punctum in B. Diviſà lineà A B in C, (centro gravitatis Corporum A B.) ſumatur C E æqualis C D. Dico, E A habebit celeritatem corporis A poſt occurſum; E B vero, corporis B, et utrumque in eam partem, quam demonſtrat Ordo punctorum E A, E B. Quodſi E incidat in punctum A vel B, ad quietem redigentur corpora A vel B.



5. Quantitas motus duorum Corporum augeri minuive poteſt per eorum occurſum; at ſemper ibi remanet eadem quantitas verſus eandem partem, ablatâ inde quantitate motus contrarii.

6. Summa Productorum factorum à mole cujuſlibet corporis duri, ducta in Quadratum ſuæ Celeritatis, eademſemper eſt antè et poſt occurſum eorum.

7. Corpus durum quieſcens, accipiet plus motus ab alio corpore duro, ſe majori minorive, per alicujus tertii, quod mediæ fuerit quantitatis, interpoſitionem, quam ſi percuſſum ab eo fuiſſet immediatè. Et ſi corpus illud interpoſitum, fuerit medium proportionale inter duo reliqua, fortius aget in quieſcens.

Conſiderat Author in his omnibus (ut ipſe ait) Corpora ejuſdem materiæ, ſive id vult, ut eorum moles æſtimetur ex pondere.

Cæterim ſubjungit, notaſſe ſe miram quandam Naturæ legem, qua demonſtrare ſe poſſe affirmat in corporibus Sphæricis, *quæque generalis ipſi videtur in reliquis omnibus ſive duris ſive mollibus, ſive directe ſive oblique ſibi occurrentibus*, viz. *Centrum commune Gravitatis duorum, trium, vel quotlibet Corporum, æqualiter ſemper promoveri verſus eandem partem in linea recta, ante et poſt occurſum.*

An

An Account
Concerning the Reſolution *of* Equations in Numbers; *imparted by Mr.* Iohn Collins.

This Account ſhould have been annex'd to what was diſcourſed of Monſieur *Sluſius* his *Meſolabe* in the precedent Tract, if then we had found room for it. For, the Reader having there underſtood, how farr the *Geometrick* part of *Algebra* is advanc'd by that excellent perſon, 'twas likely, he would be inquiſitive to hear ſomewhat concerning the *Exegeſis Numeroſa*, or the Reſolution of Æquations in *Numbers*. For whoſe ſatisfaction herein, we ſhall here inſert the Account then omitted, being part of a narrative, formerly made by M. *Iohn Collins* touching ſome late Improvements of *Algeqra* in *England*, upon the occaſion of its being alledged, that none at all were made ſince *Des Cartes*.

1. It hath been obſerv'd by divers of this Nation, that in any Æquation, howſoever affected, if you give a Root, and find the Abſolute number or Reſolvend (which *Vieta* calls *Homogeneum Comparationis*) and again give more Roots and find more Reſolvends, that if theſe Roots or rather rank of Roots be aſſum'd in *Arithmetical* progreſſion, the Reſolvends, as to their firſt, ſecond or third differences, *&c.* imitate the Laws of the pure Powers of an Arithmetical progreſſion of the ſame degree, that the higeſt Power or firſt term of the Equation is of. e. g. In this Equation $aaa - 3aa + 4a = N$,

If *a* be =	Then N. or the Abſolutes or Reſolvends will be found to be	1. *dif*	2. *dif*	3. *dif.*
10	740	218	48	6
9	522	170	42	6
8	352	128	36	
7	224	92		
6.	132			

To wit the 3d. differences of thoſe *Abſolutes* are equal, as in the Cubes of an Arithmetical Progreſſion.

2. To find, what habitude thoſe *differences* have to the *Coefficient*, of the Equation, 'ist beſt to begin from an Unit.

3. In any Arithmetical Progreſſion, if you multiply Num-

bers by *pairs*, you ſhall create a rank of Numbers whoſe 2^{d}. differences are equal; and if by *ternaries*, then the 3^{d}. differences of thoſe Products ſhall be equal. And how to find the greateſt Product of an Arithmetical Progreſſion of any number of terms having any common difference aſſign'd, contain'd in any Number propoſed, is ſhew'd by *Paſcal* in his Tract *du Triangle Arithmetique*, where he apply's it to the Extraction of the Roots of ſimple powers.

4. It appears, How this rank may be caried eaſily by Addition, till you have a *Reſolvend* either equall or greater or leſſe, than that propoſed.

5. When you have a *Majus* and *Minus*, you may interpoſe as many more termes in the Arithmetical Progreſſion as you will, that is to ſay, Subdivide the Common difference in the Arithmetical Progreſſion, and render it leſſe; and then renew, and find the Reſolvends, which are eaſily obtain'd out of the Powers and their Coefficients, which are ſuppoſ'd knowne, and may be readily raiſ'd from a *Table* of *Squares* and *Cubes*, &c. with which kind the *Reader* may be furniſht in *Guldini Centrobaryca* and *Babingtons Fireworks*: By this means you may obtain divers Figures of the Root; and then the General Method of *Vieta* and *Harriot* runs away more eaſily, and is ſo far improv'd, that after any figure is plac'd in the Root, moſt certain Characters are given to know by aide of the ſubſequent *Dividend* and *Diviſor*, Whether the figure before aſſum'd be too great or too ſmall: or laſtly it may well be concluded, that, as in Logarithmes, when you propoſe ſuch an one as is not abſolutely given in the *Canon*, you doe by Proportional Work, uſing the aid of their firſt differences (when their Abſolute Numbers differ by *Unit*) find the abſolute Number true to 5. or 6. places further than the *Canon* gives it (the reaſon whereof is, that the firſt Differences doe likewiſe agree to about the ſame Number of places;) that I ſay, the like may be done in Æquations, after divers of the firſt figures of the root are found; provided there be the like agreement in the firſt differences of the interpoled Reſolvends.

Moreover we ought here to take notice of a more ſubtile kind of Interpolation, common to all gradual Ranks or Progreſſions of Numbers, wherein Differences happen to be equal: Of which kind the *Reader* may find Examples in *Briggii Arithmetica Logarithmica et Trigonometria Britannica*, relating to Logarithmes, Sines, and the Powers of an Arithmetical Progreſſion: But the method there deliver'd may be rendred more eaſy and general, *viz.* by aid of a *Table* of figurat Numbers, by deriving Generating differences *ſought*, from thoſe *given*; a doctrine, that eaſily flows from *Mercators Logarithmotechnia*, and of uſe in the Caſe in hand, ſhould we ſuppoſe theſe Powers and their Coefficients vnknown, or a *Table* of *Squares* and *Cubes* wanting, and give nothing more, than a few *Reſolvends* belonging to equal Moments or Spaces. And this may likewiſe be of good uſe in *Guaging*, when having the Contents of a Solid, for every 3. Inches, more or leſſe, given, without knowing the dimenſions of the Figure, and even in moſt Caſes, when the differences are Progreſſive of one kind, without knowing the Figure it ſelf, having nothing given but its Contents at ſeveral equal Parallel diſtances, each ſuch diſtance may be ſubdivided, and made as many as you pleaſe, and the reſpective Contents found by this general Method of Interpolation.*

After one Root is obtained, the Methods of *Huddenius* and others will depreſſe the Equations ſo as to obtain more, and conſequently all of them.

6. It is eaſy, by a *Table* of figurate Numbers to give the ſum of any ſuch Rank or any term in it relating to a known part of the *Series* of Equals or Roots; but *è converſo*, giving the *Reſolvend* to find the Root, coms to an Equation as difficult as that propoſed; as in D. *Wallis* his Chapter of Figurate Numbers.

7. Some affirm, they can give good Approaches for the obtaining a Root of any *pure* power, *affected* Equation, or for the finding of any of the mean Proportionals in any Rank between two extreams given.

8. Others pretend to have found out a method (incited thereto by an example *in Albert Gerards Invention Nouuelle en Algebre à Amſterdam* 1629.) ſo much, by comparing of Equations, to in-

---

*Nota. *The Author* (M. Collins) *haveing explain'd* Mercators Logarithmotechnia *in Engliſh, and illuſtrated the elegant Doctrine thereof with Examples, hath likewiſe handled this work of Interpolation, and makes the* Logarithmes *true to* 25. *or* 30. *places of figures by meer Diviſion (or Proportion;) having herein advanc'd that Author's doctrine thereof by Diviſion, which (as 'tis there illuſtrated) did not ſeem to extend farr enough. This hath already been communicated, ſome Months ſince, to ſome of the Members of the* R. *Society, and may be expected hereafter.*

creaſe or diminiſh the unknown Root of Equation, as to render it a whole number (or leſſe differing therefrom, than any Error aſſign'd,) and by *Albert Gerards* Method of *Aliquot parts* to find the ſame, and thereby the Root ſought, although it be a Mixt Number, Fraction, or Surd.

Probably this may ſympathiſe with what is promiſed by the Learned *Huddenius in Annexis Geometriæ Carteſianæ*, where he ſaith, he intended not *then* to publiſh certain Rules, he had ready; whereof one was, To find out all the irrational Roots both of Literal and Numeral Equations. This muſt be underſtood when ſuch Roots are *poſſible*; for 'tis certain, there are infinite Equations, whoſe Roots are no ways explicable, either in whole or mixt numbers, Fractions or Surds, and can be no otherwiſe explain'd, but by a *quàm proxime*.

9. The Author of this Narrative conſidering, that the *Conick Sections* may be projected from leſſer Circles placed on the Sphere, and thence eaſily (otherwiſe than hitherto hath been handled) deſcribed by Points, and that by their Interſections ſome Spherick Problem is determined, accordingly he found, that this following Problem according to the various Scituation of the Eye, and of the Projecting Plain, would take in all Caſes.

The Diſtances of an unknown Star are given from two Stars of known Declination and Right Aſcenſion; the Declination and Right Aſcenſion of the unknown Star is required.

And ſaith, he hath obſerved, that, admitting the Mechaniſme of dividing the Periphery of a Circle into any number of equal parts, or (which is equivalent) the Uſe of a Line of Chords, that this Problem, wherever the Eye be plac'd, may be reſolved by Plain Geometry, and yet the Eye ſhall be ſo plac'd, as to determin it by the Interſections of the Conick Sections; conſequently thoſe Points of Interſection (the Species and Poſition of the figures being given) may be found without deſcribing any more Points than thoſe ſought; and the Lengths of Ordinates falling from thence on the *Axes* of either figure calculated by mixt Trigonometry, and hence likewiſe the Roots of all *Cubick* and *Bi-quadratick* Equations found by *Trigonometry*.

For giving from the *Meſolabe* mention'd the *Scheme* that finds theſe Roots, it will then be required to fit thoſe *Sections* into *Cones*, which have their *Vertex* either in the Center; or an aſſigned point in the Surface of the Sphere, to which they relate as projected, and proceed to the reſolution of the Problem propoſ'd: And how to fit in thoſe Sections, ſee the 7. books of *Apollonius*, *Mydorgius*, the 3d. Volume of Des *Cartes's* Letters, *Leotaudi Geometrica practica*, *Anderſonii Exercitat. Geometricæ*.

As to the Problem it ſelf, it is determin'd on the Sphere by the Interſections of the two leſſer Circles of Diſtance, whoſe *Poles* are the known Starrs. And this Problem hath divers *Geometrick* ways of reſolution.

1. By *Plain Geometry* (in the ſenſe before-mentioned;) Suppoſing a Plain to touch the Sphere at the *North-pole*: if the Eye be at the *South-pole*, projecting thoſe Circles into the ſaid Plain, they are ſtill Circles (by reaſon of the ſub-contrary Sections of the Viſual Cones) whoſe Centers fall in the ſides of the Right-lin'd Angle, made by the Projected *Meridians*, that paſs through the known Starrs; and thus the Problem is eaſily ſolv'd in this manner.

2. If it be required to be performed by *Conick Geometry*; in one caſe it may be done, by placing the Ey at the Center of the Sphere, and projecting as before; to wit, when the longer *Axes* of the figures being produced concur above the *Vertex*; Here the *Problem* is determined by the Interſections of two Conick Sections (whereof a Circle cannot be one, unleſs its Center be in the *Axis* of the other figure.) And in this ſecond Caſe theſe points of Interſection fall in the ſame right line or projected *Meridian*, they did before, but at a more remote diſtance from the Pole-point, to wit, in the former Suppoſition, the Polar diſtance was meaſur'd by a Right line, that was the double Tangent of half the Arch; here it is the Tangent of the whole Arch. Hence it is evident, how one *Projection* may beget another, yea infinite others, altering the Scale; and how the leſſer Circles in the *Stereographick* Projection help to deſcribe the Conick Sections in the *Gnomonick* Projection: But (to reduce the matter to one common *radius*) if we ſuppoſe two Spheres equal, and ſo placed about the ſame *Axis*, that the Pole-point of the one ſhall paſs through the Center of the other, and the Touch-plain to paſs through the ſaid Center or Pole-point, and that a leſſer Circle hath the ſame poſition in the one as in the other; Then, if the Eye be at the South-Pole of the one, it is at the Center of the other; and any projected *Meridian* drawn from the projected Pole-point to paſs through both the projections of theſe leſ-

ſer Circles, the diſtances of the Points of interſection are the Tangents of the half and the whole Arch of the Meridian ſo interſected. But as to the Points of Interſection, which determine the Problem propoſed, they may be found without the aid of the former way, from a *Gnoonmick* and *Stereographick* method of meaſuring and ſetting off the ſides and angles of Spherical Triangles in thoſe Projections, which is neceſſary in what follows.

3. If the Problem is to be perform'd by *Mixt Geometry*, as by a Circle and either a *Parabola*, *Hyperbola*, or *Ellipſis*, the Circle may be conceived to be the Sub-contrary Section of a Cone projected by the Eye at the *South-pole*, and any of the reſt of the Sections by the Eye at the Center of the Sphere.

4. If by any of the *Conick Sections* however poſited; the projecting Plain may remain the ſame, but the Eye muſt be in ſome other part of the *Surface* of the Sphere, and not in the *Axis*.

Theſe things were mention'd to invite the Learned to their Conſideration: I ſhall only further adde, that we cannot ſay, what may be expected from the labours and endeavors of divers Learned men of this Nation, particularly from Dr. *Wallis*, who hath ſo excellently reſolved and conſtructed all *Cubick Æquations* at the end of the firſt Treatiſe of his *Opera Mathematica* by aide of a Cubick *Parabolaſter*, mentioning, that by ſuch Curves the Roots of all Æquations may be found: And who hath promiſed a Treatiſe of *Algebra* and *Angular Sections*, wherein the Reader need not doubt to meet with ſatisfaction in theſe Myſteries. Nor ought we to omit the mentioning of the Modeſt and Learned Mr. *Barrow*, who (among many other excellent Subjects, and particularly his Opticks now, at the Preſs) hath perform'd, what the famous Italian Geometer *Mich. A. Ricci* hath promiſ'd in *Exercitat. Geometrica* (printed at *Rome* 1666. and lately reprinted here) about *Curves* of ſeveral degrees, that ſerve to determine and reſolve all *Æquations*: which hath likewiſe been done by other Learn'd men of this Nation.

An Account of Books.

I. PRÆLUDIA BOTANICA Roberti Moriſon *Scoti Aberdonenſis*. Londini, impenſis *Jac. Alleſtry*, 1669. in 8o.

This Prelude of this Excellent Botaniſt hath two parts; The firſt gives us an Alphabetical Catalogue of all the Plants in the

Royal Garden of *Blois* in *France*, as the ſame was enrich'd by the Munificence and Encouragement of the Moſt Illuſtrius Prince *Gaſton*, late Duke of Orleans, with 360 Plants, in the ſpace of five years, by the ſingular care and Skil of our Author; who in this Catalogue hath not only given a ſuccint and pithy deſcription of the Plants here enumerated, but alſo by certain marks diſtinguiſh't the *Perennial* ones from the *Annual*; adding ſome general Obſervations, collected from the Garden above mentioned, very neceſſary and uſeful to all that are ſtudious in Botanicks.

The ſecond, contains ſome Animadverſions not inconſiderable, both on the *Pinax* of *Caſpar Bauhinus*, ſhewing his miſtakes as well in the Digeſting as Naming of Plants; and on the 3. *Tomes* of the *Univerſal Hiſtory of Plants* of *Johannes Bauhinus*.

To which is annexed a *Dialogue* between a Fellow of the *R. Society* and the Author, containing an Anſwer to ſeveral Queries propoſed; where is intimated the beſt General Method taken from Nature it ſelf, of digeſting all Plants, and reducing them to certain *Claſſes* or *Heads* according to the difference of their Seeds, Podds and Flowers; by the advantage whereof the Study and Remembring of Plants may be much facilitated, and the Contemplation thereof among all ſorts of Men exceedingly promoted: For the publiſhing of which kind of Method our Author profeſſeth himſelfe to be already in great forwardneſs, entertaining good hopes, he ſhall by the Aſſiſtance and Encouragement of the Generous, be enabled to give good ſatisfaction to the Curious therein.

II. CL. SALMASII Præfatio in Librum De HOMONYMIS HYLES IATRICÆ: Ejuſdem de PLINIO JUDICIUM. *Divione*, A. 1668. in quarto.

This Book is an Introduction to a large Volume, compoſ'd by the famous *Salmaſius*, and now in the hands of thoſe two Honourable perſons, that have taken care of the Publiſhing of this Preface; both Counſellors of the Parliament of *Burgundy*, Meſſieurs *Lantin* and *De la Mare*; which Volume gives an Account of the many and great miſtakes committed hitherto in the Hiſtory of Plants, upon the ſcore of Naming them: In the doing of which it hath come to paſs, that ſeverall names being often given to one and the ſame Plant, and *vice verſa*, one and the ſame name to different Plants, there hath enſued a great and dangerous confuſion in that large part of the *Materia Medica*, highly requiring to be rectified. Now to that Work this *Preface* prepares the way, by ſhewing to the ſtudious in

Botanicks and *Medicine*, the Argument, Order, and Uſefulneſs of the ſame, interſperſing withall the Cauſes and Origin of thoſe many Errors, which both *Antients* and Moderns have fallen into upon this Subject; as alſo the negligence of thoſe Antients; the Progreſs of *Phyſick* among the *Romans*, and the Age of the cheif Writers on this Argument: Adding alſo the Authors opinion concerning *Pliny*, what is to be approvd, what to be condemned in him, and how far we are to proceed in the admiration of that Writer.

But the Reader will doubtleſs receive the beſt ſatisfaction concerning this Book, from M. *Lantin* himſelfe, as he was pleaſ'd to give it in a late Letter of his to the Publiſher, accompanying the Preſent, he made of ſeveral Copies of it to the *R. Society*, and to divers particular Members thereof, delighting in Botanical Studies; to this effect.

S*IR, I ſend you ſome Exemplars of the Introduction to a great Work, which* M. Dela Mare *and I have cauſ'd to be printed, to excite the Lovers of Learning to facilitate the impreſſion of the Whole Book. I promiſe my ſelfe, that this* Preſent *will not be unacceptable to you, as well in reſpect of the Author, who, beſides his great Learning generally known, had the Honour to be lov'd by his* Majeſty *of* G. Brittain, *as for the worth of the Treatiſe it ſelſe; of which you may Judge by this* Preface. *Although it be a work altogether* Critical, *and which, Correcting only Errors about the Names of Simples, may ſeem to contribute but little to the knowledge of Nature, for the Advancement of which your* Illuſtrious Society *imploys all its Studies and Labors with ſo much reputation; yet I may ſay, that even this Book may ſerve for the accompliſhment of that great Deſign, foraſmuch as in diſcovering the Errors and Negligence of the Antients, and of the Moderns that have follow'd them in the Hiſtory of Plants, it ſhews the neceſſity there is to labour after a* new *Natural Hiſtory, that may be free from thoſe defects, if we intend to lay ſolid foundations for knowledge, and particularly for the Art of Medicine. In the mean time, thoſe that practiſe it, being often conſtrain'd to uſe* Simples, *the virtue of which is not known to them but by the Experience of the Antients, may by Ayd of this Book avoid very dangerous miſtakes.*

But what Judgment ſoever you ſhall make both of the Book and its Preface, I ſhall be ſatisfi'd, if you and your Illuſtrious Friends, (to whom I intreat you to preſent ſome of the Copies accompanying this,) ſhall receive them as a mark of my eſteem of the R. Society, *the deſign of which I admire as the Nobleſt, that ever was undertaken by men. I unceſſantly praiſe their Induſtry, Prudence and Sincerity, and infinitely value the parts and knowledge of thoſe, that compoſe it. And this occaſion ſhal alſo ſerve Me to &c.*

LONDON,
Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, and
are to be ſold at the *Bell* a little without *Temple-Bar*, 1669.

Numb. 47.

PHILOSOPHICAL TRANSACTIONS.

May 10. 1669.

The Contents.

Inſtructions concerning the Uſe of Pendulum-Watches *for finding the* Longitude *at Sea; together with a Method of a* Iournal *for ſuch Watches. An extract of a Letter written from Vienna concerning two* Mock-Suns *lately ſeen in* Hungary. *A Relation of the Conferences held in the Royal* Pariſian *Academy for the Improvement of the Arts of* Painting *and* Sculpture. *An Account of ſome Books.* I *INSTITUTIONUM CHRONOLOGICARUM Libri duo, una cum totidem ARITHMETICES CHRONOLOGICÆ Libellis, per* Guil. Beveregium *M. A.* II. *ELEMENTS OF SPEECH; An Eſſay of Inquiry into the Natural Production of Letters together with an Appendix of a Method to inſtruct Perſons Deaf and Dumb; by* William Holder *D. D. &c.* III. *GUAGING PROMOTED, being an Appendix to* Stereometrical Propoſitions *formerly publiſh't by* Rob. Anderſon.

Inſtructions

Concerning the Uſe of Pendulum-Watches, *for finding the* Longitude *at Sea.*

W*Hereas 'tis generally eſteemed that there is no Practiſe for the* Finding of the Longitude *at ſea comparable to that of thoſe Watches, which inſtead of a* Ballance-wheele *are regulated by a* Pendulum, *as* now *they are brought to great perfection, and made to meaſure time very equally; and many perhaps here as* *well as elſewhere being not well verſed in the ordering and managing of that Inſtrument: We thought, it might be no un-acceptable ſervice, to make known ſuch Directions, as may teach the Uſe thereof at Sea. Which we ſhall doe by now giveing you our Tranſlation of thoſe inſtructions, which ſome yeares ſince were made publick by the Worthy M.* Chriſtian Hugens *of* Zulechem, *in the* Belgick *Tongue, as they have been ſince altered or rather* enlarged *by two other Eminent Members of the R.* Society. *And they are theſe;*

1.

THoſe, that intend to make uſe of *Pendulum-watches* at Sea, muſt have two of them at leaſt; that, if one of them ſhould by mishap or neglect come to ſtop, or (being by length of time become foul) need to be made clean, there may likely always remaine one in motion.

2.

The Perſon, to whom the Care of theſe Watches ſhall be committed, is to informe himſelf from the Watch-maker or ſome other, ſo as to underſtand the inward parts of the Watches, the manner of winding them up, and how to ſet the *Indexes*, or *Hands* having the hours, minutes and ſeconds, *&c.*

3.

The Watches on Ship-board are to be hung in a cloſe place, where they may be freeſt from moiſture or duſt, and out of danger of being diſorder'd by knocking or touching.

4.

Before the Watches be brought on ſhip-board, 'tis convenient, they be adjuſted to a *middle* or *mean* day (of which more in the next *Section*:) the uſe of them being then moſt eaſy, it being little or no trouble to the Watchmakers, when they have one that is ſet Iuſt, to ſet others accordingly: But yet, if time or conveniency ſo to doe ſhould happen to be wanting, they may notwithſtanding be uſed at Sea with the like certainty, provided you know, how much they goe too faſt or too ſlow in 24. hours, as is directed in the next Section.

5.

To reduce Watches to the right meaſure of dayes, or to know how much they goe too faſt or too ſlow in 24. hours.

Here take notice, that the *Sun* or the *Earth* paſſeth the 12. *Signes*, or makes an entire revolution in the *Ecliptick* in 365 days, 5 hours, 49 min. or there about, and that thoſe days, reckon'd from noon to noon, are of *different* lengths; as is known to all, that are verſ'd in *Aſtronomy*. Now between the longeſt and the ſhorteſt of thoſe days, a day may be taken of ſuch a length, as 365 ſuch days, 5. hours *&c.* (the ſame numbers as before) make up, or are equall to that revolution: And this is call'd the *Equal* or *Mean* day, according to which the Watches are to be ſet; and therefore the Hour or Minute ſhew'd by the *Watches*, though they be perfectly Iuſt and equal, muſt needs differ almoſt continually from thoſe that are ſhew'd by the *Sun*, or are reckon'd according to its Motion. But this Difference is regular, and is otherwiſe call'd the *Æquation*; and here you have a *Table*, that ſhows it.

	Januar.		*Februa.*		*Mar.*		*April.*		*Mai.*		*Jun.*	
	m.	*ſec.*	*m.*	*ſec.*	*m.*	*ſec.*	*m.*	*ſec.*	*m.*	*ſec.*	*m.*	*ſec.*
1	6	10	0	0	4	46	14	23	19	25	16	24
2	5	47	0	2	5	3	14	39	19	28	16	13
3	5	24	0	4	5	21	14	55	19	29	16	1
4	5	2	0	8	5	39	15	10	19	29	15	49
5	4	41	0	12	5	57	15	25	19	29	15	37
6	4	21	0	16	6	15	15	39	19	28	15	24
7	4	2	0	21	6	33	15	53	19	26	15	11
8	3	44	0	26	6	51	16	7	19	24	14	58
9	3	27	0	32	7	9	16	21	19	21	14	45
10	3	11	0	40	7	27	16	34	19	18	14	32
11	2	55	0	48	7	45	16	47	19	15	14	19
12	2	39	0	57	8	3	16	59	19	11	14	6
13	2	23	1	6	8	22	17	11	19	7	13	53
14	2	7	1	16	8	41	17	22	19	2	13	40
15	1	52	1	26	9	1	17	33	18	57	13	27
16	1	38	1	37	9	21	17	43	18	51	13	15
17	1	25	1	49	9	41	17	53	18	45	13	3
18	1	13	2	2	10	1	18	3	18	39	12	52
19	1	2	2	15	10	21	18	13	18	33	12	41
20	0	51	2	28	10	40	18	23	18	26	12	30
21	0	41	2	42	10	59	18	32	18	18	12	19
22	0	32	2	56	11	18	18	39	18	10	12	8
23	0	24	3	11	11	37	18	46	18	1	11	58
24	0	18	3	26	11	56	18	53	17	51	11	48
25	0	13	3	41	12	15	18	59	17	41	11	38
26	0	9	3	56	12	34	19	4	17	30	11	28
27	0	6	4	12	12	53	19	9	17	19	11	18
28	0	3	4	29	13	12	19	14	17	8	11	9
29	0	1			13	31	19	18	16	57	11	0
30	0	0			13	49	19	22	16	46	11	52
31	0	0			14	6			16	35		

	Jul.		Aug.		Sept.		Oct.		Nov.		Dec.	
	m.	ſec.	m.	ſec.	m.	ſec.	m.	ſec.	m.	ſec.	m.	ſec.
	10	45	11	7	19	41	29	16	31	13	21	14
	10	38	11	16	20	1	29	30	31	3	20	44
3	10	31	11	25	20	22	29	43	30	53	20	14
4	10	25	11	36	20	43	29	56	30	43	19	44
5	10	19	11	48	21	4	30	9	30	32	19	14
6	10	13	12	1	21	25	30	22	30	20	18	44
7	10	7	12	14	21	47	30	34	30	8	18	14
8	10	2	12	28	22	9	30	45	29	55	17	44
9	9	58	12	42	22	31	30	55	29	40	17	14
10	9	54	12	57	22	52	31	4	29	23	16	44
11	9	51	13	12	23	13	31	12	29	6	16	14
12	9	49	13	27	23	33	31	19	28	48	15	44
13	9	47	13	43	23	53	31	26	28	30	15	14
14	9	46	13	59	24	13	31	32	28	11	14	43
15	9	46	14	16	24	33	31	38	27	51	14	12
			14	33	24	53	31	43	27	30	13	41
17	9	47	14	50	25	13	31	47	27	8	13	10
18	9	49	15	8	25	33	31	50	26	45	12	40
19	9	52	15	26	25	52	31	53	26	22	12	10
20	9	56	15	45	26	11	31	55	25	58	11	40
21	10	0	16	4	26	30	31	55	25	34	11	10
22	10	4	16	23	26	49	31	55	25	10	10	40
23	10	8	16	42	27	8	31	55	24	45	10	10
24	10	13	17	1	27	26	31	54	24	20	9	41
25	10	18	17	21	27	43	31	52	23	55	9	13
26	10	23	17	41	28	0	31	50	23	30	8	45
27	10	28	18	1	28	16	31	47	23	4	8	17
28	10	34	18	21	28	32	31	43	22	38	7	50
29	10	41	18	41	28	47	31	37	22	11	7	23
30	10	49	19	1	29	2	31	30	21	43	6	58
31	10	58	19	21			31	22			6	34

By the help of this *Table* you will always know, what a Clock it is by the Sun preciſely, and conſequently, whether the Watches have been ſet to the right meaſure of the *Mean* day, or no; uſing the *Table*, as follows.

When you firſt ſet your Watch by the Sun, you are to ſubduct from the time obſerved by the Sun, the Æquation adjoyned to that day of the Month in the Table, and to ſet the Watches to the remaining hours, minuts and ſeconds, that is, the Watches are to be ſet ſo much ſlower, than the time of the Sun, as (in the Table) is the Æquation of that day; ſo that the Æquation of the Day, added to the time of the Clock, is the true time by the Sun. And when after ſome days, you deſire to know by the Watch the time by the Sun, you are to add to the time, ſhew'd by the Watch, the Æquation of that day; and the Aggregate ſhall be the time by the Sun, if the Watch hath been perfectly well adjuſted after the meaſure of the *Mean* days; for the doing of which, this will be a Convenient way;

Draw a Meridian line upon a floor (the manner of doing which is ſufficiently known; and note, that the utmoſt exactneſs herein is not neceſſary:) and then hang two plummets, each by a ſmall thred or wire, directly over the ſaid Meridian, at the diſtance of ſome 2. foot or more one from the other, as the ſmalneſs of the thred will admit. When the middle of the Sun (the Eye being placed ſo, as to bring both the threds into one line) appears to be in the ſame line exactly (for the better and more ſecure diſcerning whereof, you muſt be furniſh't with a glaſs of a dark colour, or ſomewhat blackt with the ſmoak of a Candle,) you are then immediatly to ſet the Watch, not preciſely to the hour of 12. but by ſo much leſs, as is the Æquation of that day by the Table. E. g. If it were the 12 of *March*, the Æquation of that day being by the Table, 8 min. 3 ſec; theſe are to be ſubducted from 12. hours, and the remainder will be 11. hours, 51. min. 57. ſec; to which hours, minutes and ſeconds you are to ſet the *Index* of the Watch reſpectively: Then after ſome days you are to obſerve again in the ſame manner, and likewiſe to note the hour, min. and ſec. of the Watch; to which you are to add the

Æquation of theſe days, taken out of the Table; And if the Aggregate doe Iuſt make 12.hours, the Watch is ſet adjuſted to the right meaſure; but if it differ, you are to divide the minutes and ſeconds of that difference by the number of the days between both the Obſervations, to get the daily difference. Let us ſuppoſe, this ſecond Obſervation to have been made the 20. of *March*, viz. 8. days after the firſt, and finding, that the Middle of theSun being ſeen in the Meridian in the ſame line

h. m. ſec.

with the two threds, as before, the Watch points 11—51—7

The Æquation of the 20 of *March*, by the Table, is---0—10--40

Which being added to the time, ſhow'd by the

Watch, gives ———————————— 12 — 1--47

If this had been Iuſt 12 hours, the Watch would have been well adjuſted, but being 1. min. 47. ſec. more than 12, it hath gone ſo much too faſt in 8.days. And theſe 1 min. 47. ſec. that is, 107. ſec. being divided by 8, there comes 13⅜ ſec. for the difference of every 24. hours; which difference being known, if you want time, or have no mind to take the pains to adjuſt the Watch to its right meaſure (this being not neceſſary, ſince you may bring it thus on ſhip-board) note onely the daily difference, and regulate your ſelf accordingly, as hath been mention'd. But if you will adjuſt it better, you muſt remove the leſs weight of the Pendulum a little downwards, which will make it goe ſlower; and then you muſt begin to obſerve anew by the Sun, as before. If it had gone too ſlow, you muſt have remov'd the mention'd weight ſomewhat upwards. And this is of that importance in the finding out of *Longitudes*, that, if it be not obſerv'd, you may ſometimes in the ſpace of 3 months miſreckon 7. degrees and more (yet without any fault in the Watches;) which under the *Tropicks* will amout to above 400 Engliſh miles.

Having ſhew'd, How the Watches may be adjuſted at Land, or how their daily difference may be known; next ſhall follow, How the ſame may be done, when a Veſſel rides at anchor, it being hardly feſible when ſhe is under ſaile.

In the morning then, when the Sun is juſt half above the *Horizon*, note, what hour, min. and ſec. the Watch points at, if it be going; if not, ſet it a going, and put the *Indexes*, at what hour, min. and ſec. you pleaſe. Let them goe till Sun-ſet, and when the Body of the Sun is juſt half under the Horizon, ſee, what hour, min. and ſec. the *Indexes* of the Watch point at, and note them too; and reckon, how many houres *&c.* are Paſſ'd by the Watch between the one and the other: which is done by adding to the Evening-Obſervation the hours, *&c.* that the morning-Obſervation wanted of 12. or 24. in caſe the Hour-hand hath in the mean time paſſ'd that hour once or twice; otherwiſe the difference only gives the time. Then take the half of that number, and add it to the hours, *&c.* of the morning Obſervation, and you ſhall have the hours, *&c.* which the Watch did ſhow, when the Sun was in the *South*; whereunto add the Æquation in the Table belonging to that day, and note the ſumme. Then ſome days being paſſ'd (the more the better,) you are to doe Iuſt the ſame: And if the hour of this laſt day be the ſame, that was noted before, your Watch is well adjuſted; but if it be more or leſs, the difference divided by the number, elapſed between the two Obſervations, will give the daily difference. And if you will, you may let it reſt there, or otherwiſe, removing the leſſer weight of the Pendulum you may adjuſt it better.

	H.	m.	ſec.		H.	m.	ſec
E. g. Suppoſe *March* 11th in the Morning, when the Sun half appears above the Horizon, the Watch points at	5	30	10		0	10	3
In the Evening, when the Sun appears half ſet, at	5	20			11	59	57
To know by the Watch the time elaps'd between both, ſubduct the time of the riſing	5	30	10				
From	12	0					
Reſts	6	29	50				
Whereunto adding the time of the ſetting	5	20	6				
There comes for the time elapſed between them	11	49	56	iff.	11	49	56
Whereof the half is	5	54	58		5	54	58
Which added to the time of the Suns riſing	5	30	10		0	10	3
There comes the time of the Watch when the Sun was in the South	11	25	8	~~diff~~	6	5	1
To which adding the Æquation of the 11th of *March*	0	7	45		0	7	45
The Summe is	11	32	53		[illegible]	12	46
Seven days after, *viz.* *March* 18, let the riſing of the Sun be obſerv'd, and the Watch point then at	5	19	4		11	58	57
And at his ſetting, let the Watch point at	5	25	2		0	4	55
To find the time elaps'd between them, ſubduct the time of the riſing,	5	19	4	Or,	11	58	51
From	12	0	0		24	0	0
Reſts	6	40	56		12	1	3
To which adde the time of the ſetting	5	25	2		0	4	55
And you'l find the time paſt between them	12	5	58		12	5	58
Whereof the half is	6	2	59		6	2	59
Which adde to the time of the riſing	5	19	4		11	58	57
And you have the time when the Sun was in the South	11	22	3		6	1	56
Whereunto adding the Æquation of *March* 18	0	10	1		0	10	1
The Summe is	11	32	4		6	12	57
Which Summe if it had agreed with the firſt, *viz.*	11	32	53		6	12	46

p. 976

then had the watch been ſet to the right meaſure; but ſeeing the latter is leſs than the former, the difference being 49. ſec; the Watch hath by ſo much, in 7. days, gone too ſlow; which 49 *Sec.* divided by the number of days, you have 7 *Sec.* for the daily difference; and by ſo much the Watch goes too ſlow in 24. hours.

You may alſo, inſtead of the Suns riſing and ſetting, take two equall Altitudes of the Sun, before and after Noon, and having noted the time given by the Watches at the time of both the Obſervations, proceed with it in the ſame manner, as was juſt now directed for obſerving the Sun in the Horizon. In either of which ways there may be ſome Error, cauſed by the Suns Refraction, which is inconſiderable, and therefore needs not to be taken notice of.

6.

By means of theſe Watches to find at Sea the Longitude of the Place, where you are.

Give to each of the Watches a name or a mark, as A, B, C; and before you ſet faile, ſet them to the time obſerv'd by the Sun in the place, where you are, and whence you are departing, allowing for the Æquation of the day, whereon you make your Obſervation; Which day you are to note, if the Watches be not well adjuſted; otherwiſe it is not neceſſary.

Then afterwards being at Sea, and deſiring to know the *Longitude* of the place where you are, that is, how many degrees the Meridian of that place is more *Eaſterly* or *Weſterly*, than the Meridian of that place where you did ſet the Watches; you muſt obſerve by the Sun or Stars, what time of the day it is, as preciſely as is poſſible, and note at the ſame time, to what hour, minutes and ſec. the Watches doe point (which time, if the Watches be not ſet to the right meaſure, is by the known daily difference to be adjuſted,) adding thereunto the Æquation of the preſent day, which gives you the time of the day, ſhew'd by the Sun, at the place where the Watches were ſet: And if this time of the day be the ſame with that, obſerv'd where you are, then you are under the ſame Meridian with the place, where the Watches were ſet by the Sun; but if the time of the day, obſerv'd where you are, be greater than that ſhew'd by the Watches, you may be aſſur'd, that you are come under a more *Eaſterly* Meridian; and if leſs, you are come under a more *Weſterly*. And counting for every hour of difference of time, 15 degrees of Longitude, and for every minute, 15, minutes or ¼ of a degree, you ſhall then know, how many degrees, minutes, *&c.* the ſaid Meridians doe differ from one another.

E. g. Suppoſe, the Watches A, B, C, were ſet at the place, whence you parted, on the 20 of *February*, to the time of day obſerv'd by the Sun, abating the Æquation of the 20th of *Febr.* (viz 2 min, 28, ſec.) and ſuppoſe that the Watch A. be ſet to its right meaſure, but that B. goes every day 7 ſec. too ſlow, and C. every day 12. ſec. too faſt: Some days after, ſuppoſe the 5th of *May*, deſiring to know the Longitude of the place where you are at Sea, you obſerve the time of the day

h. — min. — ſec.

there to be —— 5 — 18 — 10

And you find the Watch A. to point at —— 2 — 6 — 0

But the Watch B. to point at —— 1 — 57 — 22

Going too ſlow by 7. ſec. every day, which makes in 74. days, (viz. From the 20th of *Febr.* to the 5th of *May*) — 0 — 8 — 38

Which being added to its own time, gives the ſame

h. — min.

with that of the Watch A, *viz.* —— 2 — 6

You find alſo the Watch C to point at —— 2 — 20

Going 12 ſec. too faſt every day, which makes in 74. days —— 0 — 14 — 48

Which being ſubducted from its owne time gives again —— 2 — 6 — 0

The time of day therefore by the Watches being — 2 — 6 — 0

Adde thereunto the Æquation of the 5th of *May* — 0 — 19 — 29

And ſo you have for the time of day at the place where the Watches were ſet —— 2 — 25 — 29

But the time obſerv'd being —— 5 — 18 — 10

Exceeds this by —— 2 — 52 — 41

Wherefore the Meridian of the place, where you are May 5th, is more Eaſterly, than the places where the Watches were ſet, by —— 2 — 52 — 41

deg. — m. — ſ.

Which being reduc'd to degrees, reckoning 15 deg. for an hour, comes to —— 43 — 10 — 15

Tis true, that from the ſame reckoning it may be concluded, that you are 180. deg. more Eaſterly, which happens, becauſe the Hour-*Index* goes round in the ſpace of 12. hours in the Watches; but the difference is ſo great, that one cannot be deceiv'd in it; elſe the Watch might be ſo made, that the *Index* ſhall goe round but once in 24 hours.

7.

To find the time of the Day at Sea.

Since that for finding the *Longitude*, the Time of the day

And after the ſame manner you are to ſeek the time by the Watch B, when the Sun was in the South; which let be ——————————— 8---38---48
But this Watch going 7. ſec. a day too ſlow, it is retarded in 91. dayes, (from the 20th of Febr. to the 22. of May) 0---10---37
Which therefore added to the ſaid time gives 8---49---25
That is the ſame time given by the Watch A. Now adding to this time of the Watches, the Æquation of the 22th of May ——————————— 0---18---10
You have ——————————— 9--- 7---35
Which is the ſame time of the day with that of the place, where the Watches were ſet when the Sun was in the ſame Meridian with the Ship, or where the Ship was at Noon.

h. min. ſec.
The difference is ——————————— 2---52---25
Wherefore this laſt Meridian is by ſo much more Eaſterly, than the firſt; which being reduc'd to *degrees* (as hath been

deg. min. ſec.
formerly directed) make ——————————— 43.--- 6---15

'Tis manifeſt, that by this way you find preciſely enough the Longitude of the place, where you were at Noon, or the Time of the Suns being in the South: which, although it differs from the *Longitude* of the place, where you are when you obſerve the Setting of the Sun, yet you may eſtimate neer enough, how much you have advanc'd, or chang'd the Longitude in thoſe few hours, by the Log-line, or other Ordinary practiſes of reckoning the Ships way; or (which is the ſurer way) by the degrees paſs'd in 24. hours by a former days Obſervation.

You may alſo, inſtead of obſerving the Suns Riſing and Setting, obſerve the Setting firſt, and then next morning the Riſing; marking at both times the Time ſhow'd by the Watches; and find thence, after the ſame manner as before, the Longitude of the place where the Ship was at Midnight.

Finally, you may alſo, inſtead of the Riſing and Setting of the Sun, obſerve before and after Noon two equal Altitudes of the Sun, noting the time ſhown by the Watches, and reckoning in the ſame manner, as hath been ſaid of the Riſing and Setting: Yet it is to be conſider'd, that the Altitudes of the

Sun are beſt taken, when it is about *Eaſt* and *Weſt*, as hath been already intimated. But note, that in Sailing *North* and *South* you make not the Obſervations at the Suns riſing and ſetting, but at its being *due* Eaſt and Weſt.

9.

But you may, eſpecially in ſuch Quarters, as lye farr *North* or *South*, yea and wherever you will, put the Rule here preſcribed in practiſe, by taking 2. *equal* Altitudes of ſome known *Starr*, that riſeth high above the Horizon. For you ſhall thence, according to the mention'd Rule, know at what time by the Watches the Starr hath been in the South; and ſo the *Right Aſcenſion* of that *Starr* being known, as alſo the *Right Aſcenſion* of the *Sun*, you may thence eaſily calculate, what time it *then* was: Which being compar'd with the time of the Watches, as before, ſhall give the *Longitude* of the place where you were, when you had the Starr in the Meridian.

10.

If the Watches, that have gone exactly for a while, ſhould come to differ from one another (as in length of time it may well happen, that the one or the other faile a minute, more or leſs;) in that caſe it will be beſt to reckon by that, which goes faſteſt; unleſs you perceive an apparent cauſe, why it goes too faſt; ſeeing it is not ſo eaſie for theſe Pendulum-Watches to move faſter than at firſt, as it is to goe ſlower. For, the Wire, on which the *Pendulum* hangs, may perhaps by the violent agitation of the Ship come to ſtretch a little, but it cannot grow ſhorter; and the little Weight of the *Pendulum* perhaps ſlip downwards, but cannot get up higher.

11.

When you get ſight of any known Country, Iſland or Coaſt, be ſure to note the *Longitude* thereof as exactly as you can by the help of the Rules here preſcribed. *Firſt*, thereby to correct the *Sea-Maps*, after that the Longitude of a place ſhall have been found at divers times to be the ſame, ſo that you doubt no more of it. For all *Mapps* are very defective as to the Scituation of Places in reſpect of *Eaſt* and *Weſt*, chiefly where Seas are interpos'd. *Secondly*, to be able always to know in the proſecution of your Iourney, how farr you have ſail'd from any place to the *Eaſt* or *Weſt*. And if by any notable miſchance or careleſneſs all the Watches ſhould come to ſtand ſtill, yet you may at any place, whereof the *Longitude* is certainly known, ſet them a going again, and adjuſt them there by the Sun, and ſo reckon the *Longitudes* from that ſame Meridian. For, you are to know, that you are not at all oblig'd to put *one certain* Meridian of any knowne place as a beginning of the Longitude-reckoning; this hapening only in *Mapps*, or *Tables of Longitude*: As, when you take for that purpoſe the Meridian of the *Pico* in *Teneriffe*, or that of the Iſlands of *Corvo* and *Flores* (the moſt Weſterly of the *Azores*) or any others. Yet it were very fit, that all *Geographers* agreed and pitched upon one and the ſame *Firſt* Meridian, that ſo all places might be known by the ſame Degrees as well of *Longitude* as of *Latitude*; though in Voyaging it is ſufficient, to obſerve only the difference of Longitudes, beginning to reckon from the Meridian of any place, you pleaſe, as if it were the *firſt*.

12.

If it happen, that being at Sea all the Watches ſtopp, you muſt, as ſpeedily as is poſſible, ſet them a moving again, that you may know, how much you advance from that place towards the *Eaſt* or *Weſt*: Which is of no ſmall importance, ſince, for want of this knowledg, you are ſometimes by the force of *Currents* ſo carried away, that though you ſaile *before the Wind*, yet you are driven a *Stern*; of which there are many Exampl s.

The Method
Of a Iournal for the Watches.

The Watches being diſtinguiſht by marks as A. B. or the like, every day about Noon, or when moſt conveniently you can, obſerve the time of the day by the *Sun*, or by the *Starrs* at night, and ſubduct thence the *minuts* and *ſeconds*, that are adjoyn'd to that day in the *Table*, and write the remainder down in a paper, wherein 9. *Columns* or more are mark't, placing them in the *ſecond* column, having plac'd the *day* of the *Month* in the *firſt*. And at the ſame time write down the hours, minutes and ſeconds of each Watch in a diſtinct Column, all oppoſite one to another. Then in another Column write downe the *difference* between the time taken by Obſervation, and that given by the Watches or one of them. Then, one Column for the *Latitude*: one, for the *Longitude* by the Ordinary way of reckoning: another, for the Longitude taken from the difference between the *time* found *by Obſervation*, and that given by the *Watches*: and at laſt, a large Column to note the Accidents, that befall the Watches, *&c.*

An Extract of a Letter Written by Dr. Edward Brown *from* Vienna *in* Auſtria *March 3. 1669. concerning two* Parhelia's *or Mockſuns, lately ſeen in* Hungary.

I received the account of the *Parhelia's*, ſeen *Januar.* 30th laſt, ſt.n. about one of the clock in the afternoon, over the City of *Caſſovia* in *Hungary*: It was communicated to me from a Learn'd Ieſuit, call'd Father *Michel*, who lives at *Preſburg*, but is now in this City. There were two *Parhelia's*, one on each ſide of the true Sun, and they were ſo reſplendent, that the naked Eye could not bear the brightneſs thereof. One of them (the leſſer of the two) began to decay before the other, and then the other grew bigger, and continued well nigh two houres, projecting very long rays from it ſelf. They were both on that part, which was towards the Sun, tinged with a pale yellow, the other parts being ſomewhat fuſcous. There were at the ſame time ſeen ſeveral *Rainbows*, together with the Segment of a great white Circle, of a long duration, paſſing through the two *Parhelia's* and the Sun: and all this at a time, when the Air was almoſt free from Clouds, though here and there were ſcatter'd ſome very thin ones.

A Relation of the Conferences held at Paris *in the Academy Royal for the improvement of the Arts of* Painting *and* Sculpture, *as 'tis found in the* Iournal des Scavans.

THeſe Conferences are held once in a Month by divers Able Maſters making reflexions and obſervations upon the rareſt pieces in the Cabinet of his Moſt Chriſtian Majeſty, the Eſta-

bliſhet

bliſher of that Academy. Monſieur *Colbert*, who takes a very particular care to make Arts floriſh in *France*, being pleaſed to viſit thoſe Artiſts ſome while ſince, to ſee what progreſs they made, and having receiv'd an Account of what had been done in their meetings, expreſſed himſelf to this effect, That as 'twas neceſſary, for the Teaching of Arts, to joyn Examples to Precepts, ſo he thought it proper, that from time to time the Works of the moſt excellent Painters ſhould be examin'd, and ſuch Obſervations made thereon, as would informe others, Wherein the perfection of a Picture conſiſts. Which hath been ever ſince practiſed amongſt them, as the beſt means to carry the Art of Painting to its higeſt perfection; ſuch an Examen of the beſt Pictures diſcloſing many ſecrets of that Art, for which there are no Rules, and opening a dore to debate many important queſtions, hitherto not treated of.

In the particulars, which have been made publick, of theſe Conferences, we may find

Firſt, A general *Idea* of the Art of Painting, wherein are conſider'd two principal parts, the one belonging to the *Theory*; the other regarding the *Practice*, and the dexterity of the hand. Where 'tis obſerv'd, that the Authors, that have written of Painting, have not treated of the former part, how conſiderable ſoever that be, in regard of the Diſſein and Diſpoſition of the Pieces.

Next, a Relation of 7. conferences, whereof *ſix* were made upon as many Pieces of *Raphael*, *Titian*, *Paul Veroneſe*, and M. *Ponſin*, and the *ſeventh* upon that of *Laocoon*. Where are to be met with many curious remarques, and among many others, theſe following.

M le *Brun* conſidering a Piece of *Raphael*, where is repreſented the Combat of St *Michel* with the *Divel*, obſerves, that the expreſſion particularly depends from the Bodies, which environ the Figures; affirming, that 'tis that, which ſets out the Motion and Action in the figure of St *Michel*, who ſeems to have life in this Piece: For, as if the Air were preſſed by the Weight of the Body deſcending, it cauſeth, whatever it meets with as more light, to be raiſed, and drives it on high with violence.

In another Piece, where *Titian* repreſents the Body of I. *Chriſt* carried to the Grave, M. de *Champagne*, the Elder, obſerves the dexterity of the Maſter in ordering the Colours and the Light. To make the Leggs of the Picture (which firſt preſent themſelves) to ſtand out, he hath wrapped them about with a very white linnen ſheet, and hath cloathed *Nicodemus*, who holds them, with a very vivid and very clear *Lacque*: On the contrary, to ſink the reſt of the Body, he hath ſo taken the Light of the Picture, that the Shadow of *Ioſeph* of *Arimathea*, who helps to ſupport the Leggs, falls on its head and Shoulders; which alſo contributes to impreſs on the Body the image of Death. The Order of the Colours is alſo very remarkable in the Cloaths. For betwixt the Green habit of *Ioſeph* of *Arimathea*, and the Blew Mantle of the Bleſſed Virgin, is the yellow habit of *Magdalen*, wherein what is brown and dusky, is temper'd, and borrows of the different colours about it; that the Eye may paſs by degrees from one of theſe colours to the other. And becauſe the Sleeve of *Magdalen*, which is of a bright yellow, is neer the habit of *Nicodemus*, which is alſo of a lively Colour; the Artiſt, to hinder that thoſe two vivid colours may not entrench on one another, hath turn'd up *Nicodemus's* Sleeve againſt the yellow, ſo that from the Shadow of one of theſe colours one paſſeth to the ſhadow of the other.

The Art of the Picture, ſpoken of in the *fifth* Conference, is no leſs remarkable. In this Piece, done by P. *Veroneſe*, is ſeen a Woman, whoſe Carnation colour is ſo freſh and bright, that it dazleth the Eyes: M. *Nocret* examining, what may cauſe this beauty, obſerveth, that it proceeds in part from hence, that the Maſter hath ingeniouſly drawn *before* this Woman a Child cloathed in brown; *behind* her, a man in black; and on her ſide, a *Negro*, who maketh an admirable Concert with the great luſter and ſplendor of that Carnation.

The two laſt Conferences, treating of two pieces of M. *Pouſſin*, doe furniſh among other things, very elegant Examples of different Characters ſuting different perſons. This Maſter having to repreſent many perſons gathering Manna, gives to them all different poſtures, becomming their humor; on the fore-part of the Picture there are two *youths*, who following the genius of their Age, fight about the *Manna.* Near them are *Men*, gathering *Manna* in the mean time, and eating thereof. A little farther off, appears a *Girle*, who unwilling to take the pains of ſtooping, holds out her coat to receive the *Manna* falling down, and looks on it, as if the Heavens dropp'd it for none but her: Which well expreſſeth (ſays the Obſerver) the Softneſs and diſdainful Temper of that Sexe, which loves not to take pains, and imagines that all muſt come to paſs, as they wiſh. In the other piece, which exhibits the Recovery of the *Two Blind* men, to whom our Saviour reſtored their Sight, there is an *Old* man, who comes very near, peeping, and looking as if he doubted of the truth of the Miracle: in which the Artiſt hath well obſerv'd the genius of Aged perſons, who commonly are more incredulous and diffident than others.

Beſides this, there are examin'd here and there in theſe Conferences divers Queſtions important in Painting; which would be too long to particulariſe in this place.

An Account of ſome Books.

INSTITUTIONUM CHRONOLOGICARUM Libri duo; una cum totidem ARITHMETICES CHRONOLOGICÆ Libellis: per Gulielm. Beveregium *M. A. è Colleg. S. Joh. Cant.* Londini 1669. *in* 4°.

THis Author firſt taketh notice, that though moſt Nations have been diligently endeavoring to render a good account of *Time* (having its Original and Progreſs from the Motions of the Heavens) yet caſting his Eyes upon ſome of the moſt famous Chronologers, as *Scaliger*, *Petavius*, *&c.* he found *Chronology* obſcur'd with many intricate Queſtions, fill'd with many knotty Controverſies, ſtuffed with a multitude of uncertain Comments, and deliver'd in ſuch an odd and dark method, that the knowledg thereof was not to be obtain'd without much difficulty, and loſs of Time. Whereupon he declareth his Deſign to be, To deliver the ſame from Controverſy, and only to treat of what concerns meerly the Diſtinction of Time, omitting matters of leſs concernment, and yet nothing of what may be requiſite to *Chronology* it ſelf; in which he (*truly*) aſſerts, That many things, moſt worthy to be known, may be found, for which you may look in vain elſewhere.

And what he performes herein, he doth in a Method different from others, *viz.* meerly by *Arithmetick*, without the aid of *Chronological Tables*; which, even of the beſt Authors, will hardly be found without manifold faults.

In the *firſt* Book he treats of *Time in general*; of a Moment, (*de Scrupulo*;) an Hour, a Day, Week, Month: And then of the ſeveral ſorts of Years, the *Celeſtial*, *Iulian*, *Gregorian*, *Ægyptian*, *Æthiopick*, *Perſian*, *Syriack* and *Grecian*; item, the *Aſtronomical*, *Civil*, and *Solar* Year of the Iews, and the *Arabick* year.

In the *ſecond*, the Author (ſhewing good skill in Aſtronomy) treats of *Conjunctions*, and *Eclipſes*, of the *Æquinoxes* and *Solſtices*, the *Circle of the Sun*, and the *Dominical Letter*; the *Circle of the Moon* or the Golden number, the *Roman Indiction*, and *Epacts*; of ſeveral eminent Periods or Revolutions of Time, as the *Metonick*, *Calippick*, the *Dionyſian* and Julian Period; of ſeveral *Æra's* or fixed Characters of Time, as the *Chriſtian* and *Diocleſian*; of the Age of the World according to the Accompt of the *Græcians*: Moreover of the *Iewiſh Æra*; The Æra or *Ethnick* Accompt from the taking of *Troy*; and the *Antiochenian Epocha*: the *Olympiads*, and *Agones Capitolini*: Of the *Iulian* year, the *Spaniſh Æra*; the *Æra* of the Victory at Actium; the *Epocha* of *Nabonaſſar*; as alſo of the Philippean, Alexandrian, and the Yezdegirdican Epocha; and of the *Mahumetan Æra*, the *Hegira*, or Flight of Mahomet.

In the *Arithmetical* Part, the Author ſhews not only his great skill in *Arithmetick*, even in the Speculative parts thereof, accompanied with good knowledge in the Grounds of *Geometry* but likewiſe his underſtanding of Exotick and Ancient Languages; and, as a Specimen thereof, explains the Common Characters of Arithmetick, as he doth alſo the *Indian*, *Roman*, *Hebrew*, *Samaritan*, *Græcian*, *Syriac*, *Arabick* and *Æthiopick* Characters. And to the End of the *ſecond* Book he hath annexed an *Appendix*, wherein, in *Roman* Letters, he hath explained the *Hebrew*, *Syriack*, *Perſian*, *Æthiopick* and *Arabick* Words for the reſpective Months of the Year, for the ayde of thoſe, that are not ſo much excerciſed in the *Oriental* Languages.

And the Author, finiſhing this Book in the Year 1667. ſheweth (as a general Example of all his Calculations) in what Yea of all the ſeverall *Periods*, *Æra's*, *Epocha's* and *Accompts* beforemention'd, the *Year* of our *Lord Chriſt* did then happen.

But this is not all, that is to be expected from this Author; ſince himſelf intimates pag. 179. *Sed manum de Tabula; de his enim aliisque, quæ ad Annos præſertim Menſeſque Orientales pertinent, alibi, Deo volente, fuſius agemus*: Which doubtleſs to the Learned (conſidering what is already publiſh'd by him) will be very acceptable.

II. ELEMENTS *of* SPEECH: *An Eſſay of Inquiry into the Natural Production of Letters; together with an* Appendix *to inſtruct Perſons Deaf and Dumb: By* William Holder D.D. *and Fellow of the* R. Society. London, *by* John Martyn, 1669. *in* Octavo.

To give the Reader the ſumme of what is ſaid in this well conſidered and uſeful Tract, it is as follows;

Language is a Connexion of Audible Signs, the moſt apt and excellent in whole Nature, for Communication of our Thoughts and Notions, by Speaking. *Written Language* is a Deſcription of the ſaid Audible Signs, by Signs Viſible. The *Elements* of Language are *Letters*, *viz.* Simple Diſcriminations of Breath or Voice, Articulated by the Organs of Speech.

The *Alphabet* conſiſts of ſo many Letters, as there are to be found ſuch Simple Diſcriminations And the *Written Alphabet* ought to be juſt ſo many ſingle proper Characters, deſign'd to ſignifie the Sound or Power of each Letter. And theſe are the Storehouſe of Nature, the Elements and Materials, out of which all Languages are made. Theſe Letters have their *Material* and their *Formal* Cauſes, and *Organs* proper to each. Their *Matter* is various, *viz.* Breath or Voice, *i. e.* Breath vocalized by the Operation of the *Larynx*. Their *Form* is conſtituted by the Motions and Figures of the Organs of Speech, affecting the Breath or Voice with a peculiar Sound, by which each Letter is diſcriminated.

Now to find out their juſt Number, *Firſt*, Find out the different Kinds of Matter, of which Letters are made; and theſe are in general, *Breath*, when only Spirit or Breath is articulated; and *Voice*, when Articulation is of Breath vocalized: And theſe again, more particularly, are either (after they have paſſed the *Larynx*) only in the *Mouth*; or elſe have paſſage at the ſame time through the *Noſe*. So there are four Kinds of *Matter*, Breath Oral, Voice Oral, Breath Ore-Naſal, and Voice Ore-Naſal.

Next, 'Tis to be examin'd, How many different *Articulations* can be made by ſeveral Motions and Poſtures of the Organs in the Parts of the Mouth; which applied ſeverally to the Kinds of Matter, may make ſeveral Diſcriminations of Sound to the Ear, *i. e.* ſeveral Letters. And of theſe (as to *Conſonants*, *viz.* Letters made by Appulſe) our Author finds, and hath deſcribed 9. And if poſſibly any more may be found out, he judges it to be moſt likely, that they will not recompence the Diſcoverers pains, by being of ready and graceful uſe, but will be fitter to be caſt out among ſeveral others; to which in his Scheme of Conſonants he hath prefix'd an *Obeliſk*.

Now by theſe 9 Articulations with Appulſe, there will be fram'd Conſonants *Spirital* 9; *Vocal* 9; *Naſo-ſpirital* 9; *Naſo-vocal* 9; in all 36. Then rejecting thoſe, that prove not graceful; nor eaſie to be pronounced; *viz.* 2 Spiritals, 2 Naſo-ſpiritals, and 6 Naſo-vocals, in all 17; there will remain 19 Conſonants proper for uſe, according to the deſign of Letters. And if thoſe, to whom theſe 19 Conſonants (or about that number) appear'd and ſtood in ſuch confus'd Order, ſome in Ternaries, ſome in Pairs, and ſome Single, were themſelves put into ſo much Confuſion, and ſo puzzled to give a Methodical and Natural Accompt of them, it is no matter of wonder. But now, looking upon them, as they lie in their Original *Differences* and *Combinations*, and as they are ſelected out of a Natural Stock of 9 Quaternions, or 4 Novenaries, 'tis judged, that their Nature and Differences lie moſt plain and obvious to be underſtood.

That which renders this Piece the more commmendable, is its *Uſefulneſs*, to which the Author hath excellently applied his Conſiderations of this Subject; viz. *The inſtructing of Perſons Deaf and Dumb.* In the performance of which, he hath firſt removed the great Objections and Difficulties that lie in the way, and ſeem to diſcourage that Deſign, and to portend it infeſible. Which done, he delivers thoſe particulars, that give encouragement to that Undertaking; which he doth from his own practice therein; it being certain, that ſuch a Work as this, is not to be perfected by Study alone, but muſt and will receive many hints and helps (not to be thought on otherwiſe) whilſt the Endeavour is excited, being under Experiment and Practice.

III. GUAG-

III. GUAGING PROMOTED, *Being an* Appendix to Stereomatical Propoſitions, *formerly publiſhed by* Rob. Anderſon. *Printed for* Joſh. Coniers 1669. *in* Octavo.

IN this ſmall Tract the Author reduceth his former Doctrine of *Gauging* to farther Practice, and illuſtrateth the ſame by Examples.

And firſt he ſuppoſeth the *Axis* of a *Pyramid*, *Cone*, *Sphere*, *Parabolical*, and *Hyperbolical Conoid*, and of a Figure of different *Baſes*, which he calls a *Fruſtrum* of a *Priſme*, which if round, may reſemble a Drinking Cup like an Horn, having its top ſqueezed into an *Elliptick* form, and the bottom remaining either a Circle, or be likewiſe compreſs'd; the ſaid *Axis* to be divided into equal Segments, and Plains paſſing through thoſe Segments erect to the *Axis*; to divide the above-mention'd Solids into divers Portions or Rings: and upon theſe Foundations, *viz.* That in the *Parabolical Conoid* the *ſecond* differences of the Solid Contents of the whole Figures ſo divided are equal; but in the reſt of theſe Solids their *third* Differences are equal: he hath ſuted his Examples to the *Axes* cut by the ſaid Plains at 3 Inches diſtance from each other, ſhewing firſt the nature of the differences in hand, and then ſome eaſie wayes to attain a firſt, ſecond, and third difference; and how out of them to compute the ſeveral Capacities ſought by Additions of Differences plac'd in ſeveral Columns. Laſtly, He gives directions for the more eaſie Calculation of the ſecond Segments of the *Sphere* and *Spheroid.*

But we muſt not omit to take notice, that this Author, ſpeaking *pag.* 23. of ſuch Elliptick Solids, whoſe *Baſes* are unlike, aſſerts, That every ſuch *Elliptick Solid* is equal to the *Fruſtrum* or *Truncus* of an *Hyperbolick Conoid*, the Circular *Baſes* whereof are equal to the *Elliptick Baſes* of the Solid propos'd; and the Height of the one *Fruſtrum* equal to the Height of the other: the Invention and Demonſtration whereof argues good Knowledge in Geometry.

ERRAT. in N°. 46.

P. 928. l. 1. r. *punctum* D *in* B, *ib.* l. 28. r. *fortiſſime omnium aget.*

LONDON,

Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, and are to be ſold at the *Bell* a little without *Temple-Bar*, 1669.

Numb. 48.

PHILOSOPHICAL TRANSACTIONS.

June 21. 1669.

The Contents.

The Generation of an Hyperbolical Cylindroid *demonſtrated, and the Application thereof for Grinding* Hyperbolical *Glaſſes hinted at. Experiments lately made concerning the* Motion *of the* Sap *in Trees. An Extract of a Letter lately written from* Vienna, *about Damps in the Mines of* Hungary, *and their Effects. A Chronological Accompt of the ſeverall Eruptions of Mount* Ætna. *A Relation concerning a Woman, not long ſince open'd at* Paris, *having a double* Matrix. *An Accompt of 4 Books I. THOMÆ HOBBES Quadratura Circuli, Cubatio Sphæræ, Duplicatio Cubi, Confutata à IOHANNE WALLIS &c. II. HISTORIA GERAL DE ETHIOPIA A ALTA; Pelo Padre BALTHASAR TELLES &c. III. AN HISTORICAL ESSAY, Endeavouring to make it Probable, that the LANGUAGE of CHINA is the PRIMITIVE Language; by IOHN WEBB Eſquire. IV. AN EXAMEN of the way of TEACHING THE LATIN TONGUE by Uſe alone.*

Generatio Corporis Cylindroidis Hyperbolici, elaborandis Lentibus Hyperbolicis accommodati, Auth. *Chriſtophoro Wren L L D.* et Regiorum Ædificiorum Præfecto, nec non Soc. Regiæ Sodali.

Sint (*in* Fig. *I.*) *Hyperbolæ oppoſitæ D B, E C, quarum Axis tranſverſus eſt B C, Centrum A, et una ex Aſymptotis G P; item per Centrum ſit O M ducta ad angulos rectos ipſi B C.*

Quare ſi circumducantur Hyperbolæ circa Axin OM, manifeſtum eſt, ex ea revolutione generari corpus Cylindroides Hyperbolicum *cujus Baſes ſectioneſque Baſi paralellæ ſunt Circuli. Dico inſuper, ſi idem corpus ſecetur per Aſymptoton GP, erit ſectio Parallelogrammum.*

Secetur per Axin tranſverſum ſectione circulari BNC; item per O et M in Circulos æquales & æqualiter a Centro diſtantes; item per Axin in figuram Geometricem cujus ſemiſſis eſt BDEC, in cujus plano erit Aſymptotos GP, per quam ad rectos angulos planum BDE ſecetur in plano FHP; jungantur denique HO.

Quoniam Triangulum OGH eſt Rectangulum, Ergo Quadratum OH ſive OD. minus Quadrato OG. eſt æquale Quadrato GH: et quoniam DO parallela eſt ipſi BA, et Aſymptoton ſecat in G, erit (ex proprietatibus Hyperbolæ, quæ in Conicis *demonſtrantur) Quadratum OG unà cum Quadrato AB æquale Quadrato OD, h. e. Quadratum OD minus Quadrato OG æquale Quadrato AB ſive Quadrato AN. Ergo Quadratum GH æquale eſt Quadrato AN. Quare GH et AN æquantur et ſunt ad angulos rectos ipſi GA; idemque demonſtratur de omnibus aliis ſectionibus Baſi parallelis. Quare Cylindroides Hyperbolica rite ſecatur per Aſymptoton in Parallelogrammum. q. e. d.*

Corollarium

Hinc patet, in ſuperficie Cylindroidis, *quamvis e duplici flexura conſtet, rectas nihilominus innumeras duci poſſe: Patet etiam, aliam eſſe hujus Corporis generationem, nimir. ex revolutione Parallelogrammi circa Axin manente angulo ad Axin æquali GAO, vel denique manente Linea Generatrice HR immobili, et maſſam volubilem formante aut ſecante. Et ſi acies Dolabri acutiſſima et rectiſſima ita diſponatur ad Axin, ſicut ſe habet Linea Generatrix, rotante interim. Mamphure, manifeſtum eſt, Torno tam accuratas poſſe elaborari* Hyperbolas *quam* Circulos, *cum nihil aliud requiratur ad formandam* Cylindroidem *quam ad* Cylindrum, *niſi quod in Cylindris acies dolabri eſt Axi parallela, hic vero inclinata. Itaque notandum eſt, pro Inclinatione Anguli GAO. variari ſpeciem Hyperbolæ; adeoque facilius accommodatur ad datam Hyperbolam quam ut demonſtratione opus habeat: At ſi manente angulo Generatrix magis ad Centrum accedat, exſurgit inde minor Hyperbola, ſed priori prorſus ſimilis.*

Ex hoc Principio fabrifieri jam curavit Ingenioſiſſimus Author Machinam, ſimplicitate ſua perquam commendabilem, cujus beneficio Lentes elaborentur *Hyperbolicæ*. Illius deſcriptionem vna cum Icone brevi nos etiam edituros ſperamus.

Experiments Concerning the motion of the Sap *in Trees, made this Spring by Mr.* Willugby, *and Mr.* Wray, *Fellowes of the R. Society: and communicated to the Publiſher of the Inquiries touching that ſubject in* Numb. 40.

1. IN *Birch*-trees the Sap iſſues out of the leaſt twiggs of Branches, and fibres of Roots, in proportion to their bigneſs.

2. In all Trees the Gravity promotes the Bleeding; ſo that from a Branch or Root, that bendes downward, there will iſſue a great deal more Sap, than from another of the ſame bigneſs in a more erect poſture.

3. Branches and Young trees cut quite off when they are full of Sap, and held perpendicularly, will bleed; as we experimented in *Willow*, *Birch*, and *Sycamore*: And if you cutt off their tops, and invert them, they will bleed alſo at the little ends. Hence one may conjecture, that the narrowneſs of the pores is not the ſole cauſe of the Aſcent of the Sap; for, Water that hath aſcended in the little glaſs-pipes, will not fall out againe by its own gravity, if the pipes be taken out of the water.

4. Roots of *Birch* and *Sycamore* cut aſunder will bleed both ways, that is, from that part remaining to the Tree, and from the part ſeparated; but a great deal faſter from the part remaining to the Tree. But in a cold ſnowy day the Root of one *Sycamore*, we had bared, bled faſter from the part ſeparated, and ten times faſter than it did in warm weather before.

5. In *Birches* the Sap does not iſſue out of the Barke, be it never ſo thick, but as ſoone as ever you have cutt the Barke quite through, then it firſt begins to bleed.

6. The Bark being quite pared off above an hands breadth round, about ſeverall *Birches*, did much abate the Bleeding of the Trees above the bared places, but did not quite ſtop it.

7. The Sap doth not only aſcend between Bark and Tree,

and in the prick't Circles between the ſeverall coats of Wood; but alſo through the very Body of the Wood. For, ſeveral young *Birches* being nimbly cut off at one blow with a ſharpe axe, and white paper immediately held hard upon the topp of the remaining trunk, we ſtuck downe pins in all the points of the paper as they appear'd wet: and at laſt, when the moſt of the paper became wet, taking it away, but leaving the pins ſticking, we found them without any order, ſome in the Circles, and ſome in the Wood between. And to confirm this further, we cauſed the Body of a Tree to be cut off aſlope, and then cut the oppoſite ſide aſlope likewiſe, till we brought the top to a narrow edge; ordering the matter ſo, that the whole edge conſiſted of part of a coat of Wood, and had nothing of a prick't Circle in it, which notwithſtanding, the Sap aſcended to the very top of this edge, and wetted a paper laid upon it.

8. To find out the motion of the Sap, whether it aſcended only, or deſcended alſo; we bored a hole in a large *Birch*, out of which a drop fell every 4th or 5th pulſe. Then, about a handsbreadth juſt under the hole, we ſaw'd into the Body of the tree, deeper than the hole: whereupon the bleeding diminiſh'd about one half; and having ſaw'd Iuſt above this hole to the ſame depth, the bleeding from the Hole ceas'd quite; and from the ſaw'd furrow below decreas'd about half: and it continued bleeding a great while after at both the ſaw'd furrows, the hole in the middle remaining dry. We repeated this with much the like ſucceſs upon a *Sycamore*.

9. Some Trees of the ſame kind and age bleed a great deal faſter and ſooner than others; but always Old trees ſooner and faſter than Young.

10. A wound, made before the Sap riſes, will bleed when it doth riſe.

11. While we were making theſe Experiments, the weather changed from warme to very cold; whereupon the bleeding in the *Birches*, which begun to abate before, ceaſ'd quite. But all the *Sycamore* and Walnut-trees, we had wounded, bled abundantly; (ſome whereof before bled not at all, and thoſe that did, did ſo but ſlowly;) and ſo continued

pight

night and day, when it froze ſo hard, that the Sap congealed as faſt as it iſſued out. The Cold remitting, the *Birches* bled afreſh, the *Sycamores* abated very much, and the Walnut-trees quite ceaſed.

12. We pierced two *Sycamores* on the *North* and *Southſides*, and both of them from equall inciſions bled a greaſt deale faſter from the *North*-ſides, than the *South*, which is conſonant to the preceding Experiment.

13. We ſet ſeveral *Willows* with the wrong ends downward, and cut off ſeveral *Bryars*, that had taken root at the ſmall ends. This 29th of *May* the *Willows* have ſhot out Branches neare two foot long; and from the top of the Sets, which were a yard high, the *Bryars* have alſo grown backwards from that part, which we left remaining to the roots at the leſſer ends; they have great leaves and are ready to flower.

An Extract of a Letter Lately Written by Dr Edward Browne *to the Publiſher; concerning* Damps *in the Mines of* Hungary *and their Effects.*

SIr, having been lately in the Copper, Silver, and Gold-mines in *Hungary*, I hope ere long to give you a particular account thereof; preſenting this in the mean time concerning *Damps* in theſe Mines; whereof I underſtand, that they happen in moſt of them, that are deep; and that they happen not only in the *Cuniculi* or direct paſſages, where they walk on Horizontally (by theſe Mine-men call'd *Stollen*) but alſo in the *Putei* or Perpendicular Cutts or Deſcents (term'd *Schachts* by the ſame.) They are met with not only in places, where the Earth is full of Clay or the like ſubſtances, but alſo where it is Rocky: and one place they ſhew'd me in the Copper-mine at *Hern-groundt*, where there had been a very pernicious damp, and yet the Rock ſo hard, that it could not be broken by their Inſtruments; but the deſcent was all made by the means of Gun-powder, ram'd into long round holes in the Rock, and ſo blowne up. Another place they ſhow'd me, where there is ſometimes a damp, and ſometimes clear weather. When there is much water in the Mine, ſo as to ſtop up the lower part of this paſſage, then the damp becomes diſcoverable, and commonly ſtrong. I procured one to enter it, till his Lamp went out 4. or 5. times, in the ſame manner as at *Grotto del Cane* in Italy.

Damps are not all of the ſame force, but ſome weaker, ſome ſtronger; ſome ſuffocate in a ſmall ſpace of time, others only render the Workemen faint, with no further hurt, except they continue long in the place. The Miners (who think themſelves no Workmen, if they be not able to cure a Damp, or to cure the bad Weather, or make the Weather, as they term it) performe it by perflation, by letting the Aire in and out, and cauſing, as 'twere, a Circulation of it. In the Mine at *Herrn-groundt* they did cure a bad Damp by a great paire of Bellows, which were blown continually for many days. The ordinary remedy is by long Tubes, through which the Air continually paſſing, they are able to digg ſtreight on for a long way without impediment in breathing. For ſome *Cuniculi* are 500. fathoms long; which will not ſeeme ſtrange to any one that ſhall ſee the Mapp of the Copper-mine at *Herrn-groundt* or the Gold-mine at *Chremnitz*. And in the Silver-Trinity-mine by *Schemnitz*, I paſs'd quite under a great Hill, and came out on the other ſide. At *Windſchach*-mine by *Schemnitz* they ſhow'd me the place, where 5. men and a Gentleman of quality were loſt; for which reaſon they have now plac'd a Tube there. The like they place over all doores, and over all ways, where they digg right on for a great ſpace, and have no paſſage through. At *Chremnitz* they told me, that 28. men had been killed at one time in 4. *Cuniculi*, 7. in each; and in the ſinking of *Leopold's*-pitt, which is 150. fathoms deep, they were much troubled with damps, which they remedied in this manner.

They fixed a Tube to the ſide of the *Schacht* or *Pitt*, from the top to the bottom; and that not prouing ſufficient, they forc'd down a broad flat board, which cover'd or ſtopp'd the Pitt, or touched very near the ſides of it, on all ſides but where the Tube was; and ſo forc'd out all the Air in the pitt through the Tube: which work they were forc'd often to repeat. And now they having divers other paſſages into it, the Air is good and ſufficient; and I was drawn up through it without the leaſt trouble in breathing.

But beſides this miſchief from poiſonous Exhalations, Stagnation of the Air, or Water impregnated with minerall ſpirits, they ſometimes periſh by other ways. For there being in theſe Mines an incredible maſs of wood to ſupport the Pitts and the Horizontal paſſages, (the *Putei* and *Cuniculi*) in all places but where 'tis Rocky, men are ſometimes deſtroy'd by the wood ſet on fire. And in the Gold-mine at *Chremnitz* the wood was once ſet on fire by the careleſneſs of a boy, and 50 Miners ſmothered thereby; who were all taken out but one, that was afterwards found to be diſſolv'd by the Vitrioll water, nothing eſcaping either of fleſh or bones but only ſome of his cloaths. I am *&c.*

Vienna April. 20 1669.

A Chronological Accompt *Of the ſeveral* Incendium's *or Fires of Mount* Ætna.

THe preſent Fire of *Ætna*, (whereof there was lately a Relation printed here in the *Savoy*) will make it appear not unſeaſonable to reflect back upon former Ages, and to collect from Hiſtory the ſeverall Eruptions hapned there, together with the times of them, and ſome obſervations recorded by Authors concerning the ſame.

To paſs by what is related by *Beroſus*, *Orpheus* and other leſs credible Authors, about the Eruptions of this Mountain, both at the time of the ingreſs of the *Ionian* Colonies into Sicily, and that of the *Argonautes* (which latter was in the 12th Age before the Chriſtian account;) we ſhall firſt take notice of that, which happen'd at the time of the Expedition of *Æneas*, who being terrified by the fire of this then burning Mountain, left that Iſland; whereof *Virgil* l. 3. *Æneid.* gives this notable deſcription;

Ignarique viæ, Cyclopum allabimur oris;
Portus ab acceſſu ventorum immotus et ingens;
Ipſe ſed horrificis juxta tonat Ætna ruinis,
Interdumque etiam prorumpit ad æthera nubem
Turbine fumantem piceo et candente favillá.
Attollitque globos flammarum, et ſidera lambit.

Interdum ſcopulos, avulſaque viſcera Montis
Erigit eructans, liquefactaque ſaxa ſub auras
Cum gemitu glomerat, fundoque exæſtuat imo.

After this we find in *Thucydides*, that in the 76. *Olympiad*, which is about 476. before Chriſt, there was another Fire, and about 50. years after that, another.

Then, in the time of the *Roman Conſulls* there haped four Eruptions of *Ætna*, recorded by *Diodorus Siculus* and *Polybius*.

The next was in the time of *Julius Cæſar*, related by the ſaid *Diodorus* to have been ſo feirce, that the Sea about *Lipara* (an iſland neere *Sicily*) by its fervent heat burnt the Ships, and kill'd all Fiſhes thereabout.

Another we read of in the Reign of *Caligula*, about 40. years after Chriſt, which was ſo dreadful, that it made that Emperour, then being in *Sicily*, to fly for it.

About the Martyrdome of the Romiſh S. *Agatha* it burned againe very fiercely; though ſome ſay, that by vertue of her interceſſion it was ſtay'd from reaching *Catania*.

Againe it burnt A. C. 812. in the Reign of Charles M.

Then from the year 1160 to 1669. whole *Sicily* was ſhaken with many terrible Earth-quakes, and the Eruptions of the ſame Mountain deſtroyed a vaſt tract of inhabited land round about it, and reacht as far as *Catania*; the Cathedral of which it deſtroy'd, and the religious men living in it.

Againe, in the year 1284. there happened another terrible fire about the time of the death of *Charles* king of *Sicily* and *Arragon*.

A. 1329 untill 1333. there was another. A. 1408. another.

A. 1444. another, which laſted till 1447.

A. 1536. another, which laſted a year.

A. 1633. another, continuing ſeveral years.

A. 1650. it burnt on the North-Eaſt-ſide, and vomited ſo much fire, that by the fiery Torrents, cauſed thereby, great devaſtation was made, as *Kircher* relates in his *Mundus ſubterraneus*; whoſe aſſiſtance we have alſo made uſe of in the foregoing Chronology together with that of *Philotheus*.

The ſame Author, having been in *Sicily* himſelf, obſerveth, that the people of *Catania*, digging for Pumice-ſtones, do find at the depth of 100 palmes (which is about 68. feet) ſtreets paved with Marble, and many footſteps of Antiquity; an argument, that Towns have ſtood there in former ages, which have been overwhelmed by the Matter caſt out of this Mountain. They have alſo found ſeveral Bridges of Pumice-ſtones, doubtleſs made by the flux of the fiery Torrents, the Earth being very much raiſed ſince.

Now whether theſe Eruptions are cauſed by actual ſubteraneous Fires, lighting upon combuſtible matter; or by Fire ſtruck out of falling and breaking ſtones, whoſe ſparks meet with Nitro-ſulphureous or other inflamable ſubſtances heap'd together in the bowels of the Earth, and by the expanſive violence of the Fire forc'd to take more room, and ſo burſting out with the impetuoſity we ſee; may not be unworthy of a Philoſopher's ſpeculation.

An Account

Concerning a Woman having a Double Matrix; *as the Publiſher hath Engliſhed it out of* French, *lately printed at* Paris, *where the Body was opened.*

This Figure (which in the *Cut* here annex'd is the II.) repreſents the two [*] Matrixes, found *januar.* 6 1669. by *Benoit Vaſſal* Chirurgeon, opening the Body of a woman of [illegible]2. years of age, of a ſanguin Conſtitution, and a maſculin port. Theſe two Matrixes were ſo well diſpoſed by an extraordinary contrivance of Nature, that the True one had conceived eleven ſeverall times, *viz.* 7. males and 4. femals, all born at the full time, and all perfectly well form'd; but they were at laſt follow'd by a brother yet a *fœtus*, that was conceiv'd in an adjunct *Uterus*, in a place ſo little capable of diſtenſion, that ſeeking enlargement, after it had cauſed to the Mother for two months and an half grievous ſymptoms, did at laſt, being of the age of about 3. or 4. months, break priſon, and found its grave in that of its mother, by a very great effuſion of blood in the whole capacity of her *abdomen*; which caſt the mother into ſuch violent convulſive motions for 3. days together, that ſhe dyed of them. VVhereupon the ſaid *Vaſſal*, after, having embalmed the parts, he had made at his houſe for a whole month together the particular diſſection thereof, before all the moſt Curious and knowing Phyſitians, Chirurgeons, Apothecaries, Mid-wifes, and other Searchers of Nature, that are in *Paris*, thought good to preſerve the Hiſtory thereof by committing it and the Figure of the parts ſpoken of, to the Preſs, together with a Table, for better explanation; which we think fit here to annex in *Latin*:

---

[*] *It may be, that that, which is by M.* Vaſſal, *Publiſher of this Relation, eſteem'd a* ſecond *Womb, is nothing elſe, but the true* Matrix *lengthen'd, or that, which by Anatomiſts is call'd* Tuba Fallopii. *See.* Bartol. *Anatom. Reform. l.* 1. *c* 27. *and others.*

A	*Pars vaginæ.*
B.	*Orificium internum Matricis apertæ.*
C.	*Collum Matricis.*
D.	*Cavitas Matricis.*
E.	*Linea ſeparans cavitatem Matricis.*
F.	*Uteri fundus.*
G.	*Duo ſinus, inventi in fundo Uteri.*
H.	H. *Craſſities Uteri.*
I.	I. *Ligamentum latum, ſive productio Peritonæi lateris ſiniſtri, continens in plicatura ſua Vaſa deferentia et ejaculantia.*
K.	*Arteria Spermatica.*
L.	*Vena Spermatica.*
M.	*Teſticulus.*
N.	*Verum vas Ejaculatorium inſertum fundo* Vteri *per ſinum ibi inventum.*
	Alterum vas Ejaculans, quod ingreditur Collum Uteri, quò ejaculantur mulieres à conceptu.
P.	*Tuba Vteri.*
R.	*Ligamentum rotundum.*
S.	*Ligamentum latum ab ea parte, ubi* Spurius hic Veterus *formatus eſt.*
U.	*Vena Spermatica.*
T.	*Arteria Spermatica.*
Y.	*Teſticulus.*
Z.	*Pars Tubæ.*
2.	*Verum vas jaculatorium, quod fundum Uteri ingreditur per ſinum ſupra dictum.*
3	*Alterum Iaculatorium, abiens in Vteri collum.*
4.	*Pars lacerata à fœtu aucto.*
5.	*Fœtus eo ſitu, quo inventus fuit Amnio ſuo obvolutus.*
6.	*Vaſa Umbilicalia.*
	Placenta, ſubſtantiæ cuidam carnoſæ adhærens.
8.	*Subſtantia carnoſa.*
9.	*Ligamentum rotundum.*

An Accompt
Of ſome Books.

I. *THOMÆ HOBBES Quadratura Circuli, Cubatio Sphæræ, Duplicatio Cubi, confutata, Auth. JOHANNE WALLIS S. T. D. Geometriæ Profeſſore Saviliano,* Oxon. *1669. in* 4°.

WHen the Publiſher intended to give notice to the World of Mr. *Hobbeſ's* Book very lately come abroad, concerning the *Quadrature of the Circle &c.* he ſoon found another, containing both that and the Confutation of it together.

The Author of this Confutation obſerveth two grand miſtakes in Mr. *Hobbs's* Tract; the *firſt* in the Demonſtration of his firſt Propoſition, where theſe words, *Aut ergo in Triangulo A G G, triangulum rectangulum, cujus vertex ſit A, æquale Sectori A C L ſumi nullum poteſt; aut P Q L; C Y P, ſunt æqualia,* are upon our Authors Examination not at all prov'd, nor true. It ſeems, M. *Hobbs* had only prov'd, That *If P Q L, C Y P, be equal, Then ſuch a Triangle may be;* but not the Converſe, *If thoſe be not equall, then ſuch a Triangle cannot be.* For, if P Q L be not equall, but a little bigger than C Y P; and conſequently, the Right-angled Triangle A Y Q ſo much bigger than the Sector A C L; it is manifeſt, that a Line drawn parallel to the Baſe Q Y, a little nearer to the *Vertex* A, may cut off a like Right-angled Triangle (a little leſs then A Y Q) which may be equall to the Sector A C L.

Beſides this (which overthrows all, in the examiners Iudgement) the other great miſtake of M. *Hobbs* is alledged to be in the Demonſtration of the *ſecond* Propoſition; where (ſuppoſing by the firſt Propoſition a ſquare found equall to a Circle) he argues, That, becauſe the Square takes in as much of what is left out by the Circle, as the Circle takes in of what is left out by the Square; therefore a Cube anſwering to that Square, compar'd with a Sphere anſwering to that Circle, will doe ſo too: (which would have been well argued, *ſaith the Examiner,* of a Cylinder on that Circle, of equall height with a Cube on that Square; but not ſo of a Sphere.) So that he ſeems here to have miſtaken a *Cylinder* for a *Sphere.*

Beſides theſe two (which doe influence all that follows) Mr *Hobbes* alſo, in his 2d *Figure*, ſuppoſeth (untruly, ſaith Dr *Wallis*) without proof, That (on the common Center A) the Arches drawn by Y. O. h, will cutt the Line A G in the ſame points b, c, l, where the ſtreight Lines e b, z c, k l, (parallel to C G) doe cut the ſaid Line A G: (which do influence all thoſe Propoſitions, which depend on theſe Suppoſitions.) Other particular miſtakes obſerved by our Author are here omitted.

N. On this occaſion the Reader is made acqainted, that all the works of Dr Wallis, which of late have been ſcarce, are now to be had at the Shop of Moſes Pitt *Bookſeller at the White Heart in* Little Brittaine.

II. HISTORIA GERAL DE ETHIOPIA A ALTA, Em Conimbra A. 1660. in fol.

This Hiſtory written in the Portugueſe Language, as tis now moulded, by Padre *Balthezar Tellez*, Provincial of the Ieſuits of Portugall, out of that of Padre *Manoel d' Almeyda*, was not ſeen, I think, here in England before now, an Exemplar of it having been lately tranſmitted and preſented to the *R. Society* from *Liſbon* by Padre *Hieronymo Lobo* (one of the ſame order) by the care of Sir *Robert Southwell* Knight, his Majeſties Envoy Extraordinary to that Court.

Paſſing by the accompt and relations, given in this Book, concerning the kingdoms and Provinces, comprehended under the *Abyſſin* Empire, and its cuſtoms, Government, Militia, Citties, Revenues, Emperors, Religion, Diſcoveries and pretended Converſions there made by the Portugueſe, together with the Contradictions and Diſappointments, which thoſe of Religious Orders have met with in that Empire; We ſhall only take notice here of the Heads it contains of a Philoſophicall nature: Concerning which there is to be found a good deſcription of the true Head and Courſe of the River *Nile* together with a plaine Mapp thereof; as alſo of the Lake *Dembea*, through which the ſaid River paſſeth, and of all the Cataracts of it; and then of the Climate, and Temperature, Mountains, Fertility, Herbs, Trees, Animals Wild and Tame, and the inclinations of the inhabitants; beſides, of the Read Sea, and the reaſon of its Appellation: Touching which particulars we muſt not here enlarge, but remit the Reader to the Book it ſelf; or (ſince Copies of it are difficult to be had) to the Relations lately Engliſh'd by Sir *Peter Wych*, and printed for Mr *John Martyn*; wherein the maine paſſages, which concerne the Natural productions and other Curious Obſervables of that vaſt Country, are deſcribed.

III. An HISTORICAL ESSAY Endeavouring a Probability, That the LANGUAGE of CHINA is the *Primitive Language*; by *John Webb* Eſquire. Printed for *Nath. Brook* in London, 1669. in 8o.

This ſurpriſing Eſſay attempts to make it out from Authorities, Judged by the Writer thereof unqueſtionable, *That* the *Chineſe* have been a people, ever ſince the Flood of *Noah* and before the Confuſion of Tongues (at which they were not preſent in his opinion;) *That* their Language hath continually in all times, from their firſt beginning of being a Nation, been preſerv'd in written Books; *That* the Characters, wherein thoſe Books be written, are the ſelf ſame, which from all Antiquity were extracted from their Original Hieroglyphicks; *That* in thoſe Characters their Language hath ever ſince conſiſted, and, according to them, is at this preſent day ſpoken purely; and *that* by the ſame Characters their Language is generally underſtood through the whole *Chineſe* world: From all which, conſidered together, the Author concludes, that the *Mother* or *Natural-Language* of *China* remaines in its Antient purity without any alteration.

How credible the Allegations here deliver'd, and how cogent the Diſcourſes and Inferences, grounded thereon, are, we muſt leave to the Judgement of the ſagacious Reader; and ſhall only further take notice of the ſingular diligence of this Author in collecting occaſionally and abbreviating many of the moſt remarkable Obſervations of *China* recorded by the beſt Writers of that Empire. E. g. *That* the *Chineſe* have had the Uſe of Letters longer by farr, than any other people; *that* the remote parts of *Aſia* were planted before the diſperſion of Babel; *that* China was the firſt planted Contry after the Flood; *that* thoſe Plantations were undertaken and ſetled before the remove to *Shinaar* (the plaine where Babel was a building;) *that* the Chineſe have diffus'd themſelves to *Corea*, *Iapan*, *Iava*, *Ceylon*, *Siam*, *Cambori*, and *Madagaſcar*, if not *Mexico*, itſelf; *that* the China-wall hath laſted near 2000 years, and yet is not injured by time; *that* the *Tartars* are become *Chineſe*, not theſe Tartars, to the preſervation of the Mother-tongue of China; *that* the *Chineſe* have ſubſiſted 4000 years without any commixture with other Nations; *that* Commerce and Conqueſt have had no influence to change the Laws, Cuſtoms, or Language of that people; *that* the Hiſtoricall Computation of the Chineſe begins from 2207. years before Chriſt, which falls out with the 40th year before the Confuſion of Tongues; *that* no Nation in the world is comparable to them for certainty in Chronology, &c.

And as to their Ingenuities and Arts, he notes, *That* the Loadſtone and Compaſs hath been in uſe among them above 1100 years, and Paper-and Ink-making, above 180. years, both before Chriſt; *that* they prepare Ink of the ſmoak of oyle; *that* they have been long acquainted with the Invention of Gunpowder, and Fireworks, as alſo with the Manufacture of making and dying of Silk, invented by one of their Empreſſes; that their Potters myſtery and the manner of making Porcelain veſſels excels all other practiſes of that kind; and that they themſelves do ſo much eſteem it, as that they will not be ſerved in Plate; that the Earth for making *Porcelaine* is to be had in the ſole Province of *Nanking*, but that *there* they cannot make any Veſſels of it, (whether it be from the quality of the water or wood, or temper of the fire, is not known;) but muſt tranſport it to *Sincleſimo* in the Province of *Kiangſi*; that that Earth is very leane, fine, and ſhining like Sand, which they temper in water to reduce into the faſhion of little ſquare lumps; that they prepare and faſhion it almoſt after the ſame manner as the *Italians* do make their *Faenza*-diſhes, or as the *Hollanders*, in making their White Potters-work; that they make uſe of *Indigo* or *Woad* in painting their work with blew; but that for all this knowledge there remaines ſtill ſomething, neceſſary to make theſe veſſels aright, which they keep very ſecret, inſomuch that he paſſeth amongſt them for one of the greateſt Criminals, that reveals this Art to any but his own Children.

Laſtly, as to their Art of *Printing*, which was invented among them about 50. years after Chriſt, their manner is, That they cut their Letters with an inſtrument of Iron, (as we doe Wood-prints) upon ſome fit wood; lightly gluing the Written Copy thereon, whereby their Books are free from *Errata's*. They are very dextrous at it, and will cut a whole ſheet, as ſoon as a Compoſer with us can ſet one; and one man will print off 1500. in a day. They have alſo this conveniency, that their Forms may be laid by for as many impreſſions as they pleaſe, and in the mean time print off no more copies, than they find ſale for, *&c.*

IV. An EXAMEN of the way of TEACHING THE LATIN TONGUE by Vſe alone. Engliſhed out of French, and printed for Mr *Martyn* in London, 1669. in 12°.

As *Montagne* learnt the *Latin* tongue by Vſe alone, his Father having plac'd him in his Child-hood with ſuch perſons as ſpake nothing but that Language with him; ſo does the Author of this Book undertake to ſhew, that without much difficulty the like may be done with others, confirming what he ſaith, firſt, by an Example of a Boy, who having been bred, as ſoon as he was wean'd, (which was at the 22th month of his Age) like *Montagne*, ſpeaks *Latin* frankly and properly, being hardly *four* years old, and hath been ſeen by the King and all the Court at *Paris*: ſecondly by two other Children, both very young, that are entred into the ſame conduct, and in a very hopeful way of ſucceſs. To which the Author ſubjoyns a Diſcourſe of the great Vſefulneſs of this Method, the maine advantage of it being, that Children may employ in Learning Arts and Sciences, all that time, which they ſpend in acquiring the *Latin* Tongue.

Advertiſements,

1. T*He Reader is deſired, to inſert in* Numb. 47. *p.* 951. *ſect.* 10. *after theſe words,* Why it goes too faſt, *this Note* (as it may happen, when by ſome accident the *Cheeks* retaine not their proper figures.) *And now if it ſhould be ſaid, that upon any foulneſs the Watch will goe faſter by reaſon of the ſhorter Vibrations of the Pendulum, it is to be conſidered, That this is only true when the Watches have* no Cheeks, *but when they have them (as in thoſe hitherto uſed) 'tis not ſo.*

2. *If it ſhould be demanded, Why in the ſame* Tract *uſe hath not been made of* Tycho's *Æquation of Time, nor of that of* Bullialdus, *but one is given different from both? The Anſwer is, That the* Table, *there publiſht, is the Difference of the* Right Aſcenſion *of the Sun at Noon from the* Mean motion, *accounting from the 1ſt of* February; *which muſt be the* true *Æquation; unleſs the Velocity of the Earth's Motion about her own* Axis *be not conſtantly the ſame.*

Errat.

Numb. 47. *p.* 945. *In the 2d columne blot out* diff. *before 6. 5. 1. and put it before the 3d rank of numbers above it, viz. before* 11. 49. 56.

LONDON,
Printed by *T. N.* for *John Martyn* Printer to the *Royal Society,* and
are to be ſold at the *Bell* a little without *Temple-Bar*, 1669.

Numb. 49

PHILOSOPHICAL TRANSACTIONS.

July 19. 1669.

The Contents.

Obſervations concerning the Bath-Springs. *An Extract of a Letter, about the Icy and Chryſtallin Mountains of* Helvetia. *Some Obſervations concerning* Japan, *its Scituation, Temperature, Productions, Cuſtoms &c An Accompt from* Paris *concerning a great Metallin* Burning Concave*: and ſome of the moſt conſiderable Effects of it. An Accompt of four Books I. MARC. MALPIGHII Diſſertatio Epiſtolica De BOMBYCE,* Regiæ Societati Anglicanæ *dicata. II. DESCRIPTION ANATOMIQUE d'un CAMELEON, d'un CASTOR, d'un DROMEDAIRE, d'un OURS, et d'une GAZELLE. III. LABYRINTHUS ALGEBRÆ, Auth. JOH. JAC. FERGUSON. IV. An ANSWER to HYDROLOGIA CHYMICA of* William Simpſon *by ROBERT WITTIE D. M.*

Obſervations *Concerning the* Bath-Springs, *communicated by Mr.* Joſeph Glanvill, *in a Letter to the Publiſher dated* June 16. 1669: *at the* Bath.

Sir, I Have now made the moſt carefull Inquiry, I can, concerning our *Baths*; and have theſe particulars to return to you in anſwer to your *Queries*.

1. The Country round this Citty is very hilly and uneven;

but the Hills lye in no order; they are generally rocky and ſteepe from South-weſt and by Weſt, to North and by North: th, whole Tract of the Country, within 5. and 7. miles, abounds with Coal-mines, more or leſs. But there are no other conſiderable Mines, that I can hear of, nearer then *Mendip*, which is 10. miles hence, excepting ſome of Lead at *Berry* in *Glo-ceſter-ſhire*, which lyes up on the North of this place, about 4. or 5. miles diſtant.

2. The Hills for the moſt part afford a Free-ſtone; and on the North-weſt of *Lanſdown* (which hath that ſituation to the Town, and is juſt above it) the Stones, digg'd there, are a ſort of hard ſtone, commonly call'd a *Lyas*, blue and white, poliſhable.

3. The Town and Baths are of very great Antiquity. Beſides what I find in very ancient Chronicles to that purpoſe, one of our great Antiquaries (Mr. P.) aſſerts, that theſe Baths were 800. years before Chriſt. Which if ſo, would give occaſion to inquire, how conſiſtent with it that *Hypotheſis*, concerning the Cauſe of the Heat of theſe Waters, would be, which makes it to be the Fermentation of Minerals *in fieri*; and, whether it be likely, that the Minerals, through which theſe waters paſs, ſhould be in that ſtate of imperfection ſo many hundred years, and that the whole diſpos'd matter in thoſe places ſhould not be perfectly concreted in ſo great a Tract of time. You doubtleſs know the other conjecture, which ſuppoſeth the cauſe of this heat to be, That two ſtreames having run through and imbibed certain ſorts of different Minerals, meet at laſt, after they have been deeply impregnated, and mingle their liquors, from which commixture ariſes a great fermentation, that cauſes heat; like as we ſee it is in *Vitriol* and *Tartar*, which though ſeparately they are not hot, yet when mingled beget an intenſe heat and ebullition between them. This ſeems to me a probable cauſe of the laſtingneſs of the heat of theſe waters. But it is not my buſineſs to offer *Hypotheſes*; therefore craving pardon for this digreſſion, I proceed in my Account.

4. It is affirm'd here, that the Town for the moſt part is built upon a Quag-mire, though the places all about it are very firm ground. Some workmen, that have been employ'd in digging,

have found a mire ten foot deep: without the North-gate, the higeſt place of the Town, at ſeaven. The Earth between is a kind of rubbiſh; ſometimes they find pitching a mans length under ground, and paſſages for the water to paſs: 7. or 8. foot down they have met with *Oyſter-ſhells.*

5. The Town and Country circumjacent, generally abound with cold Springs: and in ſome places the hot and cold ariſe very near each other; in one place, within two yards, and in others, within 8. or 9. of the main Bathes.

☞ 6. The Guides of the *Croſs-Bath* informe me, that, when there is a great Weſt-wind abroad, ſtanding by the Springs they feel a cold air ariſing from beneath: if the Wind be at Eaſt, and the morning cloſe with a little miſling rain, the *Croſſ-Bath* is ſo hot as ſcarce to be endur'd, when the *Kings*-and *Hot-Baths* are colder than uſual. In other winds let the weather be how it will, this Bath is temperate. The Springs that buble moſt are coldeſt. The *Croſ-Bath* fills in 16. hours, both in Winter and Summer, without any difference from heat or cold, flouds or drought. That of the *Kings*, in 12. or 14.

7. A man may better (ordinarily) endure 4. hours bathing in the *Croſs-bath*, than 1½ in the others. In the *Queens* Bath (which hath no Springs of its own; but comes all out of the *Kings*) they have found under a flat ſtone, which upon occaſion was taken up, a Tunnel, and a yeelding mudd in and under it, into which they thruſt a pike, but could feel no bottom. In the *Kings-bath* there is a Spring ſo hot, that it is ſcarce ſufferable, ſo that they are fain to turn much of it away, for fear of inflaming the Bath. The hotteſt Spring will not harden an Egge.

8. The Bath-water does not paſs through the body like other Minerall waters; but if you put in Salt, it purgeth preſently. Upon ſetlement it affords a black mudd, uſefull in aches, applyed by way of *Cataplaſme*; to ſome more ſucceſfull then the very waters. The like it depoſits upon Diſtillation, and no other. Nor hath any more been diſcover'd upon all the Chymical examinations, that have come to our knowledge. One Dr *Aſtendoff* found, that the colour of the Salt, drawn from the *Kings*-and *Hot-bath*, was yellow; that, which was

extracted from the *Croſs-bath*, white. This Doctor concluded, that the *Croſs-bath* had more of *Allum* and *Niter*, than the hotter Bathes, which abound more with *Sulphur*. And yet *that* Bath looſens ſhrunk ſinews, by which it ſhould ſeem it abounds not much with *Allum*. It is harſher to the taſte then the other Baths, and ſoaks the hands more.

9. A man cannot drink half the quantity of ſtrong drinks in the Bath, that he can out of it; but if he hath drank before to exceſs, it allay's much, and is a great refreſhment to the body. The Bath provoketh Urine.

10. They are very uſefull in diſeaſes of the Head; Palſies, Epilepſies and Convulſions: In Cuticular diſeaſes, Leproſies, Itches and Scabbs: In all Obſtructions of the Bowels, as Spleen, Liver, and Meſentery; and the ſcirroſity and hardneſs of thoſe parts: In moſt diſeaſes of Women; In the Scurvey and Stone: as to which laſt, while I am writing, an Alderman of the Citty aſſures me, that his Wife; who had been exceedingly troubled with the Stone, went into the *Croſs-bath* for it, and voided there ſeveral ſtones as bigg as thoſe of Olives, and was never troubled with that diſtemper after. The Bath is alſo good in *cold* Gouts, as they call them. The ſame Alderman tells me, that it gives him preſent eaſe, when he is troubled with the fits of it. He uſes to goe in, aſſoon as the fit takes him, which then goes off preſently, and returns not in a conſiderable time after: He puts his feet upon the hotteſt ſprings in the *Kings-Bath*. But it hath a contrary effect in *hott* Gouts; and ſome, who are troubled with that diſtemper, tell me, that the Bath puts them into a fit, if they goe into it without preparation; or, if they have the fit before, it inflames it more, and ſends it about the body, and diſables the Joynt ſo, that there is no treading on it for the preſent. Further, the Bath is effectuall in the diſeaſes of Children, particularly the *Rickets*, removing the humors, that proceed from it, without faile. 'Tis alſo good for Women, that are apt to miſcarry, if us'd moderately. The Bath-guides goe in, when they are ready to lye down; and other woemen of the Town uſe it ordinarily throughout their time, and are never obſerved to miſcarry. It facilitates deliverance. Beſides, it is very effectuall for the ſtrengthning of broken Bones, and

good in all cold and moiſt diſtempers and weakneſs of Nerves, Stupefactions, Relaxations, and violent Pains: in all which it gives eaſe, except the *Lues Venerea*; for in that (except the malignity be overcome by the methods of Phyſick) it exaſperates the pain more. 'Tis an excellent remedy to remove the remaining weakneſs in Gouts, as hath been remarkably exemplified in old men, even to the age of 83. years.

11. There is no inſtance of Cures perform'd by it in former times, but we have experience of the ſame in ours; yea and in ſome others, as in Dropſies, Cachexies, Spleen &c. In which caſes they were ſhy heretofore of uſing the Bath, for fear of confirming thoſe Obſtructions, whereas 'tis now found, that their Cure is facilitated by it.

12. The Bath-guides live to a very great age, ſometimes to near 100. years; ordinarily, if they are temperate, to 70. There are two at this time above 80, a man and his wife.

13. In the *Croſs bath* the Guides have obſerved a certain black Fly with ſealed wings, in the form of a *Lady-cow*, but ſomewhat bigger. They ſay, it ſhoots quick in the water, and ſometimes bites. It lives under the water, and is never found but in very hot weather: They ſuppoſe, it comes up with the Springs. It is not to be ſeen elſewhere. I had one of thoſe Inſects ſent me laſt year, which I preſerv'd till I came to *London*, intending to have given it you; but I know not, how I loſt it there.

14. The *Croſs-bath* eats out ſilver exceedingly; and I am told, that a ſhilling in a weeks time hath been ſo eaten by it, that it might be wound about one's finger. The Baths agree (as the vulgar ſpeaks) with Braſs, but not with Iron: for, they will eat out a ring of *this* metall in 7. years, when Braſs-rings ſeem to receive no prejudice at all from it.

15. When Women have waſht their hair with the mixture of beaten eggs and oatmeal, this will poiſon the Bath ſo, as to beget a moſt noiſome ſmell, caſting a ſea-green on the water, which otherwiſe is very pure aud limpid. This will taint the very walls, and there is no cleanſing of it, but by drawing the Bath.

16. In Summer the Baths purge up a green ſcum on the top, but in Winter never; but then leave a yellow on the Walls.

17. The Walls that keep in the hot ſprings are very deep-ſet, and large; 10. foot thick, and 14. deep from the level of the ſtreet. The cement of the wall is tallow, clay, lime and beaten bricks. In the year 1659. the *Hot-bath* (a Bath particularly ſo call'd, of equall heat with the *Kings-bath*) was much impaired by the breaking out of a Spring, which the workmen at laſt found again, and reſtored. In digging they came to a firm foundation of factitious matter, which had holes in it like a Pumice-ſtone, through which the water played; ſo that 'tis like the Springs are brought together by Art: which probably was the Necromancy, the people of antient times believed and reported to have contrived and made theſe Baths; as in a very antient manuſcript Chronicle I find theſe words: *When* Lud Hidibras *was dead*, Bladud *his Son, a great Nygromancer* (ſo 'tis there writ) *was made King, and he made the wonder of the hot Bath by his Nygromancy; and he reigned* 21. *years, and after he died, and lyes at the new Troy.* And in another old Chronicle 'tis ſaid, *That King* Bladud *ſent for Necromancers to* Athens *to effect this great buſineſs*; who 'tis like were no other then cunning Artificers, well ſkill'd in Architecture and Mechanicks.

18. It hath been obſerv'd, that leaves, like thoſe of Olives, come ſometimes out of the Pump of the *Hot-Bath*.

Theſe, Sir, are all the Obſervations I have been able to collect yet: if any thing elſe material ſhall hereafter come to my knowledg about theſe matters, I ſhall not fail to impart them, God permitting. Perhaps theſe things may adminiſter occaſion to more Queſtions relating to the Bath, and their *Phænomena*. If you or any other ingenious perſon of the R. *Society* ſhall propoſe any to me, I ſhall take what care I can to have them punctually anſwer'd. I am *&c.*

Extract of a Letter,

Written by Mr. Muraltus *of* Zurich, *to M.* Haak, *a Fellow of the R. Society, concerning the Icy and Chryſtallin Mountains of* Helvetia, *call'd the Gletſcher. Engliſh'd out of Latin by the Publiſher, as follows;*

THe higeſt Jcy Mountains of *Helvetia* about *Valeſia* and *Auguſta*, in the Canton of *Bern*; about *Taminium* and *Tavetſch* of the *Rhætians*, are alwayes ſeen cover'd with

Snow. The Snow, melted by the heat of the Summer, other Snow being faln within a little while after, is hardned into Jce, which by little and little in a long tract of time depurating it ſelf turns into a Stone, not yeilding in hardneſs and clearneſs to Chryſtall. Such Stones cloſely Joyned and compacted together compoſe a whole Mountain, and that a very firm one; though in Summer-time the Country-people have obſerved it to burſt aſunder with great cracking, Thunder-like: which is alſo well known to Hunters to their great coſt, foraſmuch as ſuch cracks and openings, being by the Winds covered with Snow, are the death of thoſe, that paſs over them.

At the foot of theſe mountains are with great labour digg'd out Chryſtals, which are found among other foſſils, of two ſorts and colors; ſome of them are darkiſh and troubled, which by ſome are call'd the Chryſtal-ore, to be plenteouſly found in the aſcent of Mount *Gotthard*; others tranſparent, very pure and as clear as Venice-glaſs; ſexangular, great and ſmall: as in the mountains about *Valeſia*, and the Town call'd *Urſelen* at the foot of the Hill *Schelenin* they are digg'd out, and ſold at a good rate. Of this latter kind my Parents, four years agoe, tranſmitted a very bigg and fair one to *Milan* for 80. pound ſterling.

This is, what I have obſerved about theſe Hills; What I ſhall farther learn of the people, inhabiting thereabout, to whom I have written a month ſince, I ſhall impart to you.

In *September* 1668.

Some Obſervations

Concerning Iapan, *made by an Ingenious perſon, that hath many years reſided in that Country; as they were communicated in* French *by M. I; whence they are thus Engliſh'd by the Publiſher; who ſome months agoe occaſion'd this Accompt by ſome* Queries, *ſent to that Traveller.*

1. THe *Japoneſe* doubt not at all of their Contry's being an *Iſland*; though it be ſeparated from the Continent by ſuch narrow Channels that no veſſell of any conſiderable burthen can paſs them.

2. The Air is there very ſalubrious, but of another temper on this, than on that ſide of the Mountains, which divide *Japan*. The Plague hath never been heard of there; but the ſmall Pox and Fluxes are very frequent.

3. Their Mountains are fertil almoſt to the very top.

4. There are found almoſt all *European* ſorts of Fruit, Peaches, Apricoks, Cherries, Prunes, Apples, Pears, and particularly Pipins, Bon Chretien-Pears. Beſides theſe, there is an infinity of other Fruit; but almoſt none, but what is alſo found in ſome part or other of *India*.

5. Silver is there in its higheſt perfection, but not uſed in Trade; in which is ſeen nothing but Gold, and ſome ſmall coyn of Braſs; which latter they ſpoile by refining it too much. Steell alſo is there very good.

6. The temper of their Metals was formerly better than 'tis now; but yet they make Courtelas's or ſhort Swords exceeding good.

7. The great Mountain of *Japan* is higher than the *Pico* in *Teneriff*, ſince being above 18. leagues diſtant from the Sea-ſide, it may be ſeen above 40. leagues off at Sea. There are 8. *Vulcans* or Fire-ſpitting mountains in *Japan*; and you cannot goe into the Campagne, but you diſcover one or other of them.

8. There are many Medicinal waters, and Hott-Springs there, which the Inhabitants uſe in their diſtempers. They have particular Medicines; but they let no Blood. They make much uſe of Cauſticks, by applying upon ſome nerve or other the powder of *Artemiſia* or *Mugwort*, and Cotton, which they ſet on fire. They always drink their liquors warme.

9. There is ſo great a ſtore of Venaiſon in *Japan*, that they care little for Cattle, though there be no want of them. They employ moſt Oxen for Ploughing; and they make no Butter nor Cheeſe, nor are they lovers of Milk. They have great plenty of Corn and Rice.

10. The *Japoneſe* are proper enough of ſtature, and not uncomely in features; they have ſomewhat prominent bellys. They are exceeding active, and want no Judgement; they are alſo military and valiant.

11. No Arts are to be met with amongſts them, that are

not known in *Europe*, except that of making *Lacca*, of which there is ſome ſo fine and curious, that whereas in this Country one may buy an ordinary ſmall boxe for 3. or 4. Crowns, one of the ſame ſize, when made in Japan of exquiſite Lacca, will ſell for more than 80. crowns. The Author of this Accompt hath 4. Cabinets of this workmanſhip, which he affirmes to have coſt him above 40000 crowns, which he will not ſell under 80000. crowns.

12. The Colours, with which they dye their ſtuffs, never fade. I have ſeen one of them, which our *Vermillon* and *Couleur de feu* come not near to. It is extracted out of a Flower, like to Saffron, and one pound of it coſts an incredible price. To try, whether the Colour will not change by *Lixivium* or Lye, they apply an hot Iron to it; and if there it holds, they aſſure themſelves of the durableneſs of the Colour.

13. They have Mathematicians amongſt them, and believe Iudiciary Aſtrology, inſomuch that the Grandees undertake nothing without pre-conſulting thoſe, that make profeſſion of the ſame.

14. *Japan* yeilds divers ſorts of good merchantable Commodities; but chiefly all ſorts of ſilken Stuffs, unwrought Silk, Amber, Precious Stones, Musk, Copper, Steel, Lack-work.

15. The Country is very well peopled and exceeding rich, being exceedingly ſtored with Gold-mines; and I have ſeen ſome of the Gold-ore, which of 10. ounces yeilded 8. of the higheſt fineneſs, and pieces of the weight of 120. marks.

16. Their Buildings are very good and commodious. The Appartments are all below on the ground, ſeparated from one another by partitions of Carton painted and guilt, which may be foulded and removed like Skreens. Their floors are covered with mattes, and ſomtimes with ſilken ſtuff, embroidered velvet, and cloth of gold. All their buildings are but one ſtory high.

17. They have no other conveniences to defend themſelves from Heat and Cold, but ſuch as are uſual in Italy and Spaine.

18. They uſe the divertiſements of Comedies, which are more brave then thoſe of *Europe*. The Spectators are about 200. paces diſtant from the Theater, which being cover'd with a

vault, makes the voice of the Actors to be underſtood to the very end of the Theater. They love Hunting, and Gaming, as Dice, Cards, Cheſs *&c.* At all times of the day, and in all their viſits they take Thea and Tobacco.

19. Their Language is altogether different from the *Chineſe*; but their Prieſts, and Courtiſans, that is, the Learn'd among them, which bear the Offices of the Court, underſtand the tongue of *Chochin-China*, and by this means that of *Tunquin*, *China*, *Corea &c.* They write neither from the right to the left, nor from the left to the right, but downeward.

20. Their Government is Deſpotique; the Religion Pagan; the Chriſtian hated upon no other accompt, but that ſome of thoſe, that there profeſſed it, would perſwade the *Japoneſe* to acknowledg a Superiority above the dignity Royall, diſpoſing of Crowns and Scepters. Their Morals are very good, their *faults* being puniſh't as their *Crimes*, even Lying and Detraction. Their left hand is the more honourable, and they take horſe on that ſide.

An Account from Paris *Concerning a great Metallin* Burning Concave, *and ſome of the moſt conſiderable Effects of it: Communicated by ſeverall perſons upon the place, where Tryals have been made of it.*

IT is true, that Monſieur de *Vilette* of *Lyons*, who formerly made that Burning Concave, * which was of about 30. inches diameter (diſpoſed of to the King of *Denmark*) hath made another, which is larger, now under tryal here. It is of 34. inches diameter, and melts all ſorts of Mettals, and Iron it ſelf of the thickneſs of a Silver-Crown, in leſs then a minute of time, and vitrifies Brick in the ſame time; and as for Wood, whether green or dry, it ſets it on fire in a moment. The King hath ſeen it and the performances of it with great ſatisfaction; and his Majeſty is likely to make it his, and and then to beſtow it on his Royal Academy of Philoſophers, for making of farther Experiments with it. *So far they.*

* *Deſcribed at large in* Numb. 6. *of theſe Tranſactions.*

Nota. *This kind of* Concaves, *burning moſt forcibly of any fire we know of, even beyond that of a Wind-furnace, would be of great uſe, if they could be ſo contrived as to have a* focus *of any conſiderable largeneſs, to take in a good quantity of combuſtible matter at once.*

An Accompt of ſome Books.

I. MARC. MALPIGII, Phil. & Med. Bononienſis DISSERTATIO EPISTOLICA De BOMBYCE, Regiæ Societati dicata. Printed at London *for* Iohn Martin *and* Iames Alleſtry *Printers the R. Society, in* 4°.

THe Occaſion of this Curious and Laborious Diſcourſe will appeare from the Preface to it. The Book it ſelf gives an Acompt of the Production, Structure, Food, Growth, Sickneſſes, Workmanſhip, Changes, Generation, and Death of the *Silk-worm*; together with an accurate Anatomicall Deſcription of all, even the minuter parts of that Inſect, and the varieties of them in the ſeverall Changes, it undergoes; where yet the Author in ſuch particulars, which he finds himſelf ſhort off, or not well ſatisfied in, with great modeſty refers himſelf to the Aſſiſtance and farther conſideration of that *Society*, to whom he dedicateth this Epiſtle.

He begins with the Eggs and hatching of the Silk-worms, obſerves the Changes of their Colour: then proceeds to the growth of the Young worm; the various tryals in feeding it with divers other leaves but thoſe of Mulbery's; their ſickneſſes and the prognoſticks of them; the caſting of their skins, together with all the ſteps and the whole manner of the ſame.

In the Anatomicall Obſervations of the ſtructure of this Inſect, he takes notice, among many other things, of its *eleven* Rings or Inciſures, and of how many ſmall ones each of them is made up; giving their ſhape, different ſize, nature and compoſition. Then goes on to the Wrinkles of the Body, the Head, the Cranium, the Lip, Chin, Eyes, Teeth (cutting not by an up and down motion, but a laterall one) Hair, Leggs with their different ſhapes, articulations, claws, together with their poſture and motion for Spinning.

Of their *Internal* parts, he obſerves the quality of the humor, found in them, *viz.* concreting by the warmth of on's hand, and leaving a cruſt: next, the mucous and roſy-color'd skin, ſuppos'd to be the new skin, found under the exterior. Then he deſcribes the various Muſcles, and Fibres, both parallel, and oblique, more or leſs, together with the inſertion of the Fibres in every Ring, and of every Ring in the Cavity of its neighbouring Ring, for producing the Progreſſive Motion of the Animal; the manner of which is deſcribed very particularly.

He paſſes on to the Veſſels moiſtening all the parts, obſerving their branches and *anaſtomoſes*; their termination in one common trunck, and the curious net-work they make. Theſe veſſels prolonged, he makes to be the *Lungs*, whoſe ſtructure for Reſpiration he diligently deſcribes, illuſtrating the ſame with Obſervations made of other Inſects, and with ſome Trialls ſhewing, both that Air iſſues out of their body, and that Oily liquors will ſuffocate them, upon the Accompt only of ſtopping the orifice of their Wind-pipe. He inquires alſo, Whether the *Motion* of the *Abdomen* be neceſſary in theſe Inſects for Reſpiration, and ſeems to incline to the *Affirmative*.

From the Lungs he goes on to the *Heart*, which he ſaith reaches from the head to the taile, being of a ſtrange figure, and rather *many* hearts, than one; whoſe motion of *Syſtole* and *Diaſtole* he deſcribes, taking alſo notice, how the Vitall humor paſſes from one little heart to another.

The *Ventricle* he obſerves to reach alſo from one extreame of the Worm to the other; deſcribing its ſubſtance, ſhape, fibres, and veſſels bedewing it, together with its reſemblance to the Ventricle of other Inſects: where he particularly notes the great voracity of the Silk-worm, affirming, that it will eat as much in one day, as its whole empty body weighs.

In the ſides of the Belly about the Ventricle he finds a *Woof of Veſſels*, containing the *Silky Juyce*; deſcribing their progreſs from the mouth downeward into the belly, and their ſtrange flexures and meanders; whoſe *end* he affirmes to have at length, after a long and patient ſearch, found out. Of theſe Veſſels he makes a large and curious deſcription, as alſo of their different Juyces, as the cauſe of the different ſorts of Webbs and Baggs.

Neither is he wanting in giving an accurrate accompt of the fine texture of the *Spinall Marrow*, and the *Cranium*.

But from the Anatomy of the parts he proceeds to their *Feeding*, and obſerves the various ſpace of time for it.

He takes further notice, that though *Stench* be no prejudice to them, yet a *Southern* Wind and an extreme *Hot Air* make them ſick. He informes us alſo, how they are ordered after they have fed enough, and are ready to ſpin; as alſo, *how* they ſpin, what motions and poſtures they uſe in that work; how they apply their feet and claws; how they hold their head and other parts of the body; of what figure their Webb is; in what time the Bagg is finiſht, together with the difference of the Silk on one and the ſame bagg, and the conjunction ſometimes made by *two* worms in ſpinning *one* bagg, which he ſaith cauſeth ſuch an intanglement that the Silk cannot be wound off.

He forgets not to ſet down the *gradual Change* of the Silk-worm, after 'tis exhauſted by ſpinning; how all the parts are altered, the teſticles enlarged, and the whole diſpoſed to aſſume the form of the *Aurelia* or *Chryſalis*, diveſting it ſelf of its coat in the ſpace of 1. min. 10. ſec; the manner of which he very curiouſly deſcribes, having attentively beheld it himſelf. He adds, how the Wings and other parts are form'd for the *Papilio* or *Butterfly*, and how indeed the Wings are latitant under the ſecond and third Ring of the Worm, before it works the bagg.

Of the *Aurelia* he deſcribes its ſhape and all the parts, and particularly the remaining *Veſtigia* of the ſilky Inteſtins, the Ventricle, and the concrete melleous Juyce therein, together with ſome though rare and ſcarce perceptible motion of the Heart. Then, how the *Aurelia* changes into a *Butterfly*, and in what time, *viz.* in the ſpace of 10. days in Summer, and in a Months time in Autumne and Winter. Where he adds, how the *Eggs* begin in the Femals upon their change into *Aurelia's*, and how at laſt the Butterfly breaks out by the meanes of its Claws and a ſharp liquor.

To this he ſubjoyns a particular deſcription of the form of the *Butterfly*, and all its parts; of the Motion of its Heart, of the differencing marks of the Male from the Female; of the curious ſtructure of the *Ovarium*; the parts of generation; the coit, and the ſtrange length of the time of it, the Male beating his wings about 130. times in one copulation; the multitude of Eggs amounting to 300. 400. ſometimes 500; and the death of the poor Fly, following 5. days after the coit in Summer, but not before the 12th day in Auguſt.

He omits not to inſtruct the reader of the ways of *keeping* the *Eggs*, and the manner of ordering them for Hatching: where he takes notice of one kind of Butterfly in *Sicily*, which is made *thrice* fecund in *one* year, *viz.* in Aprill, and the end of Auguſt.

He concludes with the way of *Winding off* the Baggs, and informes us, how many threds together will make good ſubſtantiall ſilk; where he affirmeth, that ſometimes he hath reckon'd 930. *Bononian* feet of ſilk, wound off from one bagg, without the exteriour *lanugo*, and the inmoſt laſt part, which both together might make a fourth part of that length more.

II. *DESCRIPTION ANATOMIQUE d'un CAMELEON, d'un CASTOR, d'un DROMEDAIRE, d'un OURS, et d'une GAZELLE. A* Paris *1669. in* 4°.

THe Obſervations of theſe Animals diſſected were made in the Royall Library at *Paris* by ſome of the Ingenious Philoſophers there.

Of the *Cameleon* (which they ſay was an *Egyptian* one ; they alledging, that there are two other ſorts, one of *Arabia*, and another of *Mexico*) they chiefly obſerve: *First* that its contrary motions of Swelling and Un-ſwelling are not made as in other animals, dilating and preſently after contracting their breaſt for Reſpiration, in a conſtant and regular order; ſince they have ſeen it ſwell for the ſpace of above two hours, during which time it would indeed un-ſwell a little, but almoſt indiſcernibly, and alſo a little ſwell againe, but with that difference, that the dilatation was more ſuddain and more viſible, and that by long and unequall intervals; they having alſo obſerved it to ſubſide for a long time, and much longer than ſwell'd.

Secondly, that the grains in the Cameleons-Skin were diverſly poſited, and of a blewiſh-gray, when the animall was in the ſhade moveleſs, and had not been toucht a long while; but that the pawes underneath were white-yelowiſh, and the ſpace between the graines, of a pale and yellowiſh red: and that the ſaid gray, coloring him all over when at reſt, and remaining on the inſide of the skin, when flead, (which ſeem'd to argue, it was the naturall colour) did, when expoſed to the day-light, change in the Sun, ſo that all the places of its body, ſtruck by that light, took, inſtead of their blewiſh gray, a browner gray, approaching to a minim; but the reſt of the skin, not ſhone upon by the Sun, changed its gray into divers brighter colors, which formed Spots half an inch big, of an Iſabella-colour, by the mixture of the yellow pale in the graines, and the light brown in the ground of the skin: the other skin, not ſhone on by the Sun, and remaining of a gray paler then ordinary, being like cloath mixt of wool of divers colours, the ground continuing as before. The Sun ceaſing to ſhine, the firſt gray return'd by little and little, and being then toucht by one of the company, there appear'd preſently many very black ſpots on his ſhoulders and forefeet, which hapn'd not, when he was handled by thoſe that took care of him. Being wrapp'd in white linnen for 2. or 3. minutes, he was taken out whitiſh, and having kept this colour a while, it vaniſht inſenſibly: which Experience refutes thoſe, who give out, that the Cameleon takes all colors but white. Having put him on divers things of ſeveral colours, and wrapt him up in them, he aſſumed none of their colors, but the white, neither took he this, but the firſt time of the trials.

Thirdly, the ſtructure and motion of his Eyes, turning two different ways at one and the ſame time; which yet is not true of the Cameleons of *Mexico*. Where 'tis obſerv'd, that the neceſſity, impos'd by nature on all other animals to move both their Eyes together the ſame way, is not cauſed by the conjunction of the Optick nerves, becauſe that alſo is found in the Cameleon it ſelf.

Fourthly, his way of taking hold of the ſmall branches of Trees, like that of a *Parret*, who puts two of his claws before and two behind, whereas other Birds alwayes put three before, and one behind.

Fifthly, his having no Spleen; a very little Heart, and exceeding little Brain, in which appeared no mark at all of any ſence for Hearing, this animall neither receiving nor giving any ſound.

Sixtly, his Tongue being furniſht with and faſtned to a long tromp, ſerving to lanch it out, for the taking of flyes, on which he feeds, and not on Air alone; the Obſervers having found many flyes in his ſtomach and Guts; and taken notice alſo, that this Cameleon, they diſcourſe of, voided divers ſtones of the bigneſs of a pea, which he had not ſwallowed, but bred in his gutts, ſeeing one of them, being diſſolved in diſtilled vinegar, incloſ'd the head of a fly.

By which Obſervations it appears, that though *Orators* have loſt thoſe pretty ſubjects to exerciſe their Eloquence upon, concerning the Wonders of the food, and of the Change of Colours in Cameleons; yet *Philoſophers* doe now meet with new particulars, touching the motion of his Eyes and Tongue, and the manner of altering his Colour according to his paſſions, which are no leſs capable to employ their Witt; as is at large and learnedly deduced by the Authors of theſe Obſervations.

In the *Caſtor* they note;

Firſt, his two ſorts of *Hair*, one ſhort, ſoft and fine, to defend him from cold; the other long and thick, to receive the mire, in which they often wallow, and to hinder it from getting to the ſkin.

Secondly, his Teeth, formed after a peculiar manner, exceeding fit to cut Trees, which they doe to build themſelves lodgings to breed their Young ones in; for which purpoſe Nature hath alſo furniſht them with ſuch fore-feet as exactly reſemble the hands of a man; the hind-feet, proper for ſwimming, being formed like thoſe of a Gooſe.

Thirdly, his Bladders containing the *Caſtoreum* (diſtinct from the Teſticles) of which they found four great ones about the lower part of the *Os pubis*, of which two were above the other two, but cloſely joyn'd to one another, the two upper being likely to prepare that matter, and the two other, to bring it to the perfection of more conſiſtence, and unctuouſneſs, as alſo of a ſtronger ſent and deeper yellow colour; for which purpoſe the two latter are of a glandular compoſition. But under this ſecond ſort of ſacks they found yet another long one, full of liquor, more yellow and liquid, and more elaborate, then that in the former; of a different ſmell, and like to the yolk of an egg; of which they write from *Canada*, that *Caſtors* uſe it to make themſelves an appetite, when they want it, and that they ſqueeſe it out by preſſing with their paws the bladder, which contains it; and that the Savages anoint with it the Gins they ſet for theſe animals, to draw them thither.

Fourthly, his *Teſticles* not faſtned to the Back-bone, as ſeveral Authors affirme, but on the ſides of the *Os pubis* about the groyne, altogether hid, and not appearing at all, no more than the *penis*, before the ſkin was remov'd. The *Penis* contrary to that of a Dogg, which goes from the *Os pubis* to the Navil, deſcended here downeward to the vent of the excrements, at which hole it did terminate.

Fifthly, the *Heart* had its left Auricle bigger than the right (which is alſo found in ſome other animals;) whereas in Man 'tis contrary. They found no *foramen Ovale*, which many Authors aſſure to be in all Amphibious Animals, and even in Men, that are *Divers*, and ſtay long under water. But it may be, that this *Caſtor* having been kept divers years from going into the water, that hole had been cloſed.

But we muſt proceed to the *Dromedary*, wherein is chiefly noted; *that* it hath but two ſmall hooffs on the end of his feet, the ſoles of them, flat and large, being very fleſhy, and covered onely with a ſoft, thick and little callous skin, proper enough to march in the Sands of Aſia and Africa; *that* the ſix *Calloſities* of his Leggs being open'd, their ſubſtance was found to be between fleſh, greaſe and ligament, ſome having a collection of a thick purulent matter mixed; *that* that Calloſity under the Breaſt, ſtrongly faſtned to the *Sternum*, was conſiderably bigg every way, and much ſuppurated; *that* his inward parts were like enough to thoſe of an Horſe; but that in his 2d Ventricle there were many ſquare Openings, being the Entry of about 20. cavities, made like ſacks, placed between the two membranes that compoſe the ſubſtance of the whole ſtomach, in which ſacks, as in convenient receptacles, 'tis probable that Camels doe for a long while keep the water they drink in great quantity, when they meet with any, for a ſupply in dry and deſert places; *that* the *Lungs* had but one lobe; *that* the *Heart* was extraordinary bigg, *viz.* 9. inches long and 7. large; *that*, contrary to other Tongues, which are every where rough from within outwards by ſtore of ſmall eminences tending from *without* inwards, a part of this *Tongue* had them from *within* outwards *&c.*

The *Bear* hath a very particular ſtructure of his *Leggs*, and their ſubſtance, very good to eat, is a kind of thick fattiſh ligament, out of which may poſſibly iſſue that moiſture, which Authors ſay is ſuckt by this Beaſt for its nouriſhment in winter. Its *Claws* differ from thoſe of a Lyon; by being more equall and more compact. The *Teeth* differ from thoſe of a Lyon in this only, that they are leſs. The *Thorax* conſiſts of 14 Ribbs. There appeared no diſtinction in his *Gutts*, as in other animals;

they were 40. foot long, whereas thoſe of the *Lyon*, formerly diſſected by the ſame Obſervers, had but 25. The *kidneys* had a very peculiar ſtructure, *viz.* a membrane containing 56. ſmall kidneys, actually ſeparate from one another, each cover'd with its proper membrane; here and there connected by very fine fibres; every one having a large *baſe* outwards, and ſtreightning it ſelf inwards; that *baſe* being in ſome a Hexagon, in the moſt a Pentagon, and in others Square; and the whole repreſenting as 'twere a ripe *Pine-apple*: therefore probably ſo bigg, and divided into ſo many ſmaller kidneys, that it might containe and evacuate the greater plenty of ſeroſities, to be found in a Bear, becauſe he hath but little of inſenſible tranſpiration, by reaſon of the thickneſs of the habit of his body, not favourable for it. The *Brains* they obſerv'd to be 4. times bigger, than that of the Lyon they open'd. The *Eyes* exceeding little, the *Chryſtallin* very odly ſcituated, and drawn on one ſide of the *Axis* of the Eye.

But that which is particularly taken notice of in the deſcription of this Animall, is, 1. The ſtrength of its Temper and conſtitution, by which it is able, though it have but a little ſtomach, and ſtreight gutts (among which there is no *Cæcum*) to digeſt with eaſe all ſorts of edibles, raw fleſh, Fiſh, Lobſters, Inſects, Herbs, Fruits, Hony; ſupplying by the force of his temper the defect of a commodious ſtructure. 2. The ſmall capacity of its *Liver* and *Spleen* to receive excrementitious matter; which argues, that the action of the naturall Heat is ſo well regulated, that 'tis not ſubject to defect or exceſs. 3. The ſingular faculty of encreaſing to a great bulk, by which, though it be born exceeding ſmall, it grows a very big animal, its natural moiſture being ſo perfect, as to render the parts capable to extend themſelves, and to increaſe their magnitude without leſſening their ſtrength.

The *Gazelle* or wild African Shee-goat (the ſame with the *Dorcas* or *Strepſiceros*) was of the bigneſs and ſhape of an Hind, its hair fallow, except that of the belly, which was white; its Eyes big and black; the Horns black alſo, ſtreak't croſs--ways, 15. inches long, very ſharpe, pretty ſtreight, but a little turned outwards about the middle; in part hollow, and by a

ſharp

ſharp bone faſtn'd to the Head. Tooth-leſs in the upper Jaw, as being of the ruminating kind. Very cloven footed; and ſmal-hoofed before, but thick-fleſh't on the hinder parts of the leggs, like a Camel.

As to the inward parts, it had a *Liver* ſhaped like that of a man, divided into two Lobes; and in the hollow part of the Liver there were two *Lymphatick* branches, which faſtn'd the trunk of the *Vena porta* to the ſuperiour Orifice of the Stomach. The ſubſtance of this Liver plainly appeared to them glandular, each grain of it being pierced, as they thought, in the midle, by reaſon of a little red cleft they had, whence iſſued blood, when preſſed: And the cauſe, why theſe glandules ſeldome appeare vnſevered one from another, may be, that when the animal is in health they are ſpungy and fill'd out with bood, which they are not, when it is ſick, or emaciated, *&c.*

III. LABYRINTHUS ALGEBRÆ, Auth. *JOH. JAC. FERGUSON. Printed at the* Hague *in* 4°. 1667.

WHat we mention'd in *Numb.* 46. p. 931. ſect. 8. about new methods, pretended by ſome to be found out for giving the Roots of all Cubick and *Bi-quadratick Æquations*, albeit thoſe Roots are Fractions or Surds, Binomials or Reſiduals; We find ſince to be already accompliſhed by this Dutch Writer; upon the Curſory peruſal of whoſe Book we take the firſt part of it to be, as follows.

1. He ſhows, how to extract the *Square* and *Cubick* Roots out of *Binomiall* and *Reſidual* Numbers, as a *medium*, which he afterwards hath occaſion to uſe.

2. Then proceeds to give one general Rule for finding the Roots of all *Quadratick* Æquations, and commends the worth of his method from the eaſineſs, although you be incumbred with Fractions or great Numbers either in the Coefficients or Abſolute.

3. He gives one General Rule (where others make more Caſes of it) for finding the Roots of all *Cubick* Æquations, in which the Second term or *Quadratick ſpecies* is *wanting*, and then ſhows, how all other *Cubick* Æquations, wherein it is *preſent*,

may be reduc'd thereunto, by taking it away. Moreover, when ſuch Æquations, wherein you are incumbred with *Fractions* or *Surds*, either in the Coefficents or Roots, are propoſed, he goes on to find the Roots, ſought in his own method; and when not explicable but by a *quàm proximè*, according to the general method of *Vieta*, in the uſe of which method, he, determining the number of Figures in the Root, takes away the trouble of all the ſub-gradual Punctations.

4. When he comes to *Bi-quadratick Æquations*, he intimates, that all ſuch Æquations may be reduced into two *Quadratick* Æquations, but not without the aid of a *Cubick* Æquation: And firſt, when the ſecond Term or *Cubick Species* is not wanting, he ſhews how to find the ſaid *Adjutant Cubick* Æquation, by placing the two higheſt Terms of the Æquation on one ſide, and the reſt of the Termes on the other, and then finds ſuch Quantities, which, added to either ſide, render the ſame capable of a ſquare Root; and this preparation being made, he thereby obtains the *Cubick* Æquation and the Root thereof, which ſerves for the purpoſe premiſed; to wit, to divide the *Bi quadratick* Æquation propos'd into two *Quadratick* Æquations, and ſo ſolved.

Further, in regard that all Æquations are more eaſily ſolv'd, when ſome of their Terms are wanting, than when all are preſent; he proceeds to ſhew, how to take away the *ſecond* Term, and, ſuppoſing it gone, gives eaſier Rules for finding the aforeſaid *Cubick*

Æquation; by aid whereof, the propos'd *Bi-quadratick* Æquation may be divided into two *Quadratick* ones, as before.

And then, in regard it often happens, that Æquations are not otherwiſe explicable than by a *quàm proximè*, he proceeds according to the General method of *Vieta*, as in *Cubicks* laſt above mention'd.

The whole Doctrine is illuſtrated with great variety of choice Examples, and the Author intending hereafter to treat more fully of *Algebra*, promiſeth to extend his methods to Æquations of *higher* degrees, and to render the ſame more general. The remainder of the Book doth principally treat of *figurate* Arithmetick.

And here we think it fit to intimate, that divers good Treatiſes of *Algebra* have been lately publiſh't in *Low Dutch*. This Author cites Queſtions out of the 3d *Century* of *Queſtions* in the *Officina Algebræ* of *Marten Wilkins*, which we have not ſeen. *Gerhard Kinkhuyſen* hath of late years publiſh'd ſeveral diſtinct *Quarto*-Books, *viz.* A *Tract* of *Analytical Conicks*: A *Collection* of *Geometrical Problems*, *Analytically* ſolv'd; as alſo ſuch an acceptable *Introduction to Algebra*, that by the encouragement of ſome of the R. *Society* it hath been Tranſlated into *Latine*, and fitted for the Preſs; to which will be annexed the *Methods* and *Examples* of *Ferguſon* about the *Roots* of *Æquations*. And we have little reaſon to doubt, but that the juſt now mention'd *Introduction* will meet with ſuch an acceptance, as ſhall quicken the

Stationer to proceed in the Tranſlation and Printing of the reſt of the Books above-mentioned, or others of the like kind.

Ferguſon about the Matter mention'd is more full than either the *Algebra* of *Frans Van der Huips*, an *Octavo* Book in *Low Dutch*, 1654. or *Kinkhuyſen*: neither do we find, that *Ferguſon* aſcribes the Invention of thoſe Methods to himſelf.

IV. *AN ANSWER* to *HYDROLOGIA CHYMICA*, of WILLIAM SYMPSON, by ROBERT WITTIE, M. *D.* *Printed for* John Martyn *at the* Bell *without* Temple-Barr, *in* 8° 1669.

The Learned Author in this Anſwer undertakes to prove, that all the Mineral Ingredients, which he in his Firſt Book on this Subject affirm'd to be in the *Scarborough-Spaw*, are really there, and that his Antagoniſt himſelf, unawares, acknowledges them to be there; ſo that the judicious Reader of both theſe Authors will find, that the difference between them, whether in the Matter, which concerns thoſe Ingredients of the ſaid waters, or in that which reſpects the two ways of practiſing Phyſick, the *Galenical* and *Chymical*, is indeed not ſo great, as the heat of Contention ſeems to make it.

And certainly, if the Profeſſors of this Art would but lay aſide Animoſities, perſonal Reflexions, and private Conſiderations; and withall acknowledge, as they ought, that new and great diſcoveries may be made by careful Obſervations and Experiments, they would eaſily agree and joyn together, not only their Parts, Natural and acquired, but alſo the two ſo much celebrated methods of adminiſtring Phyſick, for curing both acute and chronical or contumacious Diſeaſes; which is the true way to do ſervice indeed to Mankind, and to entertain and raiſe the Credit of that Profeſſion.

Nota. *By the overſight of the Printer, ſome Lines were left out to the breach of the Senſe, in the Authors Animadverſions upon Mr.* S. *his Epiſtle, at the bottom of the* 3d *Page, which may be thus corrected*; Like that of the Travailer that went from *Jeruſalem* to *Jericho*, who fell among Thieves that ſtript and wounded him, 'tis no fault of mine; my work ſhall be like that of the Samaritane, *&c.*

ERRATA.

NUmb. 48. p. 962. l. 7. *l. Genetricem.* In the preſent Numb. p. 981. l. 18. *l. ſcaled wings.* p. 983. l. 31. *l. occaſion'd.* p. 987. l. 26. *l. beſides thoſe of.* p. 992. l. 3. *l. Shoulders.*

LONDON,
Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, and
are to be ſold at the *Bell* a little without *Temple-Bar*, 1669.

Numb. 50.

PHILOSOPHICAL TRANSACTIONS.

Auguſt 16. 1669.

The Contents.

An Invention for Eſtimating the Weight *of* Water *in* Water *with ordinary Ballances and Weights. An Extract of a Letter, containing an Accompt of a paſſage by ſea to the* Eaſt-Indies. *Some Conſiderations about* Slate. *Obſervations concerning the odd* Turn *of ſome* Shell-ſnailes, *and the* Darting *of* Spiders. *An accompt of ſome Books.*I. *GEORG. SINCLARI ARS NOVA et MAGNA GRAVITATIS et LEVITATIS.* II. *OBSERVATIONES MEDICÆ, è Muſæo THOMÆ BARTHOLINI.* III. *OTTON. TACHENII HYPPOCRATES CHYMICUS.* IV. *TH. BARTHOLINI Diſſertatio de CYGNI ANATOME, nunc aucta à CASP. BARTHOLINO F.*V. *ÆGIDII STRAUCHII BREVIARIUM CHRONOLOGICUM.* VI. *ABREGE CHRONOLOGIQUE de L'HISTOIRE SACREE et PROFANE, par le P. LABBE.*

An Invention
For Eſtimating the Weight of Water in Water *with ordinary Ballances and Weights.*

THe Author of this Invention is the Noble *Robert Boyle*; who was pleas'd to comply with our deſires of communicating it in Engliſh to the Curious in *England*, as by inſerting the ſame in the *Latin* Tranſlation of his *Hydroſtatical Paradoxes* he hath gratified the Ingenious *abroad*. And it will doubtleſs be the more welcome, for as much as no body, we know of, hath ſo much as attempted to determine, *How much* Water may weigh in Water; and poſſibly if ſuch a *Problem* had been propos'd, it would have been Iudged impracticable.

The Method or Expedient, he made uſe of to perform it as near as he could, may be eaſily learned by the enſuing accompt of a Tryall or two, he made for that purpoſe, which among his Notes he cauſed to be regiſtred in the following words.

A Glaſs-buble of about the bigneſs of a pullets egg was purpoſely blown at the flame of a Lamp, with a ſomewhat long ſtem turn'd up at the end, that it might the more conveniently be broken off. This Buble being well heated to rarify the Air, and thereby drive out a good part of it, was nimbly ſealed at the end, and by the help of the figure of the ſtem was by a convenient Weight of Lead depreſſed under water, the Lead and Glaſs being tyed by a ſtring to one Scale of a good Ballance, in whoſe other there was put ſo much weight, as ſufficed to counterpoiſe the Buble, as it hung freely in the midſt of the water. Then with a long Iron *forceps* I carefully broke off the ſeal'd end of the Buble under water, ſo as no Buble of Air appear'd to emerge or eſcape through the water, but the liquor by the weight of the Atmoſphere ſprung into the un-repleniſht part of the Glaſs-buble, and fill'd the whole cavity about half full; and preſently, as I foretold, the Buble ſubſided and made the Scale, 'twas faſtned to, preponderate ſo much, that there needed 4. *drachms* and 38. *graines* to reduce the Ballance to an *Æquilibrium*. Then taking out the Buble with the water in't, we did, by the help of the flame of a candle, warily apply'd, drive out the water (which otherwiſe is not eaſily excluded at a very narrow ſtem) into a Glaſs counterpoiſed before; and we found it, as we expected, to weigh about 4 dramchs and 30 graines, beſides ſome little that remained in the Egg, and ſome ſmall matter that may have been rarified into vapors, which added to the piece of Glaſs that was broken off under water and loſt there, might very well amount to 7. or 8. graines. By which it appears not only, that water hath ſome weight in water, but that it weighs very near * or altogether as much in Water, as the ſelf ſame portion of liquor would weigh in the Air.

** This expreſſion was added, to leave Liberty for a further inquiry, Whether the Experiment, which hereby appears convincing as to the main thing intended to be proved may not admit the having ſomething further debated, and annext about ſome circumſtantial thing or other.*

The ſame day we repeated the Experiment with another ſealed Buble, larger then the former (being as bigg as a great Hen-egg,) and having broken this under water, it grew heavier by 7. *drachms* and 34. *graines*; and having taken out the Buble, and driven out the water into a counterpois'd Glaſs, we found the tranſvaſated liquor to amount to the ſame weight, abating 6 or 7 *graines*, which it might well have loſt upon ſuch acccompts, as have been newly mentioned.

An Extract of a Letter

Written by Mr. Joſhua Childrey *to the Publiſher, containing an Accompt of a paſſage by ſea to the* Eaſt-Indies, *communicated to him by that Ingenious Travailor Mr.* Richard Smithſon *Who made two voyages into thoſe parts.*

FRom *England* to *Cape Finis Terræ* in *Gallicia* in 44. degr. *North Lat.* the Winds are as variable as with Vs; onely the Bay of *Biſcay* is more ſubject to ſtorms, and the Sea more rough, and the Waves running very high.

From thence to 34. degr. The Wind is variable alſo, but if you be within 100 leagues of the *European* Continent, it is generally inclined to *North-Eaſt*.

From 34 degrees, if you be inclining to the coaſt of *Africa*, or about the Meridian of the *Canaries*, the Wind is ſo certain, and conſtantly at *North-Eaſt* (or within two points) that it is rare to find it otherwiſe. Yet in Winter, upon the coaſt of *Africa* there are ſometimes Weſterly ſtorms, that are violent, but of no long continuance. And in Summer, when it is ſometimes calme, the Air will come variably. Theſe *North-Eaſt*-Winds hold moſt commonly to 8. degrees *North-Latitude*, and then begin the *Tornado* Winds, which are moſt part confined between 8. and 4. degrees *North-Latitude*. They are ſeldome or never more Southerly; but on this ſide the Line they have ſometimes been met between 11. and 12. degrees *North-Latitude*, and ſometimes in 9. and 10. degrees. Theſe *Tornadoes* are vncertain winds, blowing from all points of the *Compaſs* in the ſame hour, and ſometimes the wind ſhifts thus without being intermitted, and other whiles it will be ſtark calme, almoſt between every puff. They are ſo confus'd, that let 4. or 5. Ships ſail together as near as is fitting for Ships that keep company, at the ſame inſtant many times every Ship ſhall have a ſeverall and contrary wind. And this place is almoſt alwayes infeſted with horrible thunders, lightnings and rain. And the nearer you are to the *Africk*-ſhore, ſo much more dreadfull is the Thunder and Rain: but the further *Weſt-ward* you goe, the Thunder and Rain will be leſs, and the Winds not ſo vncertain; ſo that, if you go as farr Weſt, as the Meridian of the Eaſt-ſide of *Braſile*, there is little Thunder, neither doth the Wind come down in ſuch puffs and flawes; but between 4. and 8. degrees it is moſt inclined to Calmes, and very great and thick Foggs, and the Raines come not in ſuch violent ſhowers.

Likewiſe this is a ſure rule, that near the *Africk*-ſhore, and ſo for 100. or 200. leagues *Weſt*, the *North-Eaſt*-Winds commonly incline more and more to the *Eaſt*; ſo that by that time, you come to the Weſt of the Meridian of the *Azores* about 20. degrees, the *Trade* or conſtant Wind will be moſtly *Eaſt-North-Eaſt*.

Now as from 34. degr. to 44, near the Continent of *Europe*, the Winds are commonly between *Eaſt* and *North*; ſo after you come ſo farr Weſt as the Meridian of the hithermoſt of the *Azores*, they are commonly between *South-Weſt* and *North-Weſt*. And for this reaſon Ships, that are outward bound to the *Streights*, keep near the coaſt of *Portugall*, but homeward bound they are many times forced to run farr *Weſt* to fetch a Weſterly wind. Likewiſe Ships bound to the *Barbados* go by the *Canaries*, but come home a great way to the *North-Weſt* of the *Azores*. And the *Virginia*-ſhips are twice as long in going out, as they are in comming home, and many times longer: for, they come home befor the Wind directly, but goe out round about as farr as the *Tropick*, or at leaſt to 28 degrees Latitude for the benefit of the *North-Eaſt* Wind; and when that hath carried them farr *Weſt*, they come back to the *Nordward* again: and then, as the Weſterly wind hangs more or leſs Southerly, they have a good or bad paſſage.

Between 3. or 4 degrees *Nothern Latitude* the *South-Eaſt*-Wind begins to take place between the *Æquator* and the *Tropick* of *Capricorne*. But the nearer you are to the coaſt of *Africa* it is ſo much more *Southerly*; and as you approach to the coaſt of *Braſile*, it inclines more and more *Eaſterly*. And there is not only a Variation in the Wind in reſpect of *Longitude*, but alſo in reſpect of *Latitude*: for, near the *Æquator* the wind is more *Southerly*, than it is in the ſame Meridian near the *Tropick* of *Capricorne*; as for example, in the great Bay of *Guinea* (which our Seamen call the *Bight of Guiny*) the Wind (as I have been credibly inform'd) is moſtly *South*; and inclines as much to the *Weſt* as to the *Eaſt*: but in the ſame Meridian near the *Tropick of Capricorne* I am ſure it is conſtantly between *South-Eaſt* by *Eaſt*, and *South-Eaſt* by *South*. And on the contrary in that Meridian, which may be about an 100. Leagues to the *Eaſtward* of *Braſile* near the *Æquator*, the Wind is between *South-Eaſt* and *Eaſt-South-Eaſt*; and in the ſame Meridian the Winds near the *Tropick* are more Variable, but moſt part about *North-Eaſt*.

This, I ſuppoſe, is as much as you deſire for the Winds *within* the *Tropick*: and when I have told you, that in our latter Voyage from the *Line* to the *Tropick* of *Capricorne* we had many Calms, and what winds we had were very ſmall, which was in the latter half of *April* and the former half of *May*, but in our firſt Voyage in the latter half of *May* 1657. great ſtorms; I have ſaid all I can.

The Stormy days were May 16 17 18 eſpecially the 17th in 7 degrees *Southern Latitude*. Alſo the 20th and 21 in the Latitude of 12 and 13 degrees; and the 27th at night in *Southern* Latitude of 22. degrees; which ſtorme was the moſt ſudden and unexpected that ever I ſaw: for all day it was very fair weather, and ſo till 8 at night, and the wind at *North-Eaſt*, but on a ſudden came a violent ſtorm of wind at *South-Weſt*, and in a moment the whole heavens were become black and prodigiouſly dark, which continued till 4 the next morning, with intolerable rain; and then the wind came again at *North-Eaſt*, and it was preſently fair.

Near *Affrica* the *South-Eaſt*-winds hold to 28. or 29. degr. *Southern Latitude*; but towards *Braſile* from the *Tropick* of *Capricorne* to 32 degrees they are variable, and to the Southward of 32. Weſterly; as you may perceive by this following accompt.

May 29. Latit. 24. 47′. Longit. (by the plain Sea-chart) from the *Lizard*, 11. Degr. Weſt; Variation 10d 7′ Eaſt: fair Weather; the Wind from S W to W. We ſailed 50. miles.

June 1. Little wind, at S W.

June 2. Latit 26. 0 Calme all day, and a great ſtorm all night at South.

June 3. Strong wind at S S E. At 1. at night it came to E b S. and blew with the ſame violence till next day noon. At 6. in the Evening I ſaw *Mercury* very near the *Moon*, newly paſt Conjunction, as I ſuppoſed.

June 4. Latit. 26. 15′. South. Longit from the *Lizard* 9. 24. Weſt: the Wind moderate at E bS.

June 5. Latit 27. 32′. a freſh gale at E b N; dark and cloudy; but no rain.

June 6. and 7. the ſame Wind and Weather.

June 8. darke day, and calme all day and night.

June 9. calme till mid-night; then a little Wind at N W.

June. 10. Latit. 32. degr. Calme all day, and till midnight; then a freſh gale at N W, that we ſailed *66*. miles. This day we ſaw a great Number of Whales ſporting themſelves.

June 11. Latit 32. 43′. the firſt clear day we had in a fortnight. Strong wind at N W. We ſailed 141. miles.

June 12. Latit. 33 44′. Long. 5. deg. Weſt. Variat. 9. 40′. Eaſt: Clear weather, till the latter end of the night; then it rain'd: Strong wind at W N W, and a ſmooth ſea; ſo that we ſailed this day 177. miles; the moſt that our Ship ſailled in 24. houres in all the time of the two Voyages, that I ſayled in her.

June 13. Latit. 34. 15'. South. Longit. 2. 7'. Weſt. Violent wind At 4. p. m. it ſhifted ſuddainly from W N W to W b S. At 10. at night to S W b W; after midnight, to S W b S; about 4. to S S W.

June 14. very great wind at S S W About mid-night it ſhifted to W; and immediatly follow'd a very terrible ſtorm of Wind and rain, and a great over-grown Sea.

June. 15. at 7. in the morning the wind came back again to S S W, the whole day was a very dreadfull ſtorm of wind. At noon (by accompt) we were in 34. 42'. South. Latitude, and 3. 20' to the Eaſt-ward of the Meridian of the *Lizard*. The ſea was exceedingly rough. At 4. p. m. fell a great ſtorm of Hail. At night was a great *Eclipſe* of the *Moon*, which I could not at all obſerve my ſelf, becauſe the Storm raged at the time of the Eclipſe more than ever, the waves ſo beating over the ſhip, that I could not be upon the deck: but the Maſters Mates, who had the watch (to whom I gave charge concerning it) ſaid, that ſhe begun to be totally dark about half a quarter paſt 8, and began to recover ſome of her light 2. minutes before 9; as we reckoned the time by our Glaſs. As ſoon as the Eclipſe was ended, the ſtorm began to abate, and the raging of the Wind and Seas ſo calmed, that by morning we ſet up our Top-ſailes.

June 16. a little before Noon the wind came to Weſt, and continued a ſtrong gale but with fair weather.

June 17. Latit. 35. South. Longit. (from the *Lizard*) 7½ degr. Eaſt. Variation 2. 30'. Eaſt. We ſaw many great heaps of weeds in the Sea, and a great roling Sea came out of the South. A ſtrong wind (without guſts) all this 24. houres at Weſt. P. M. the sky was extream foul and thick, ſo that we fear'd more bad Weather. It continued ſo till 7. at night; and then 6. or 7. minutes it became as clear as Chryſtal (to our great admiration at ſo ſudden a change,) and ſo continued all night.

June 18. a very ſtrong wind at Weſt: a darke day and clear night. We ſailed 170. miles Eaſt.

June 19. the ſame wind and weather.

June 20. the wind much abated.

June 21. was the firſt clear day we had this month. Latit. was 35. 40'. South. Longit. 17. 40'. Eaſt-ward, from the

Lizard. Variation, 1. 4′. Weſt. The Wind was at N W. till 4. p. m; then it came to Weſt with a thick sky and cold rain. At 8. to W S W. At 3. in the mornig to *S* W, and at 6. to *S S* W. At 9. the next day to *S*outh; all ſtrong winds.

June 22. dark and cloudy. At 2. of the clock the wind came to *S S* E. At 4, to E *S* E. At 10, to Eaſt, and there continued till the 24th in the morning; which all accounted very ſtrange.

June 24. in the morning it fell calm, and was pretty warm, having been bitter cold the laſt 10. dayes.* At 3 a clock in the night a freſh gale at N N W.

June 25. Latit. 36. 10′. Longit. 21. 25′. Variation 3. 40′. Weſt. Fair weather Wind N N W

June 26. A clear day. Wind N N W. Variation 4. 30′.

June 27. in the morning calm about 9, wind and rain out of the *S* W. At night calm and fair.

June 28. A fair day, and moſt part calm; for we ſailed but 17. miles in 24. houres. At 10. at night, heaving the *Lead* we had ground 130. fathoms. the ſand like *Calais*-ſand. The Variation was 7. 10′. This was off Cape *Agulhas*, the moſt *S*outherly Land of all *Africa*, lying 90. miles E *S* E. from the Cape of *Good Hope*.

In our latter Voyage, after we came to 32. degr. *S*outh. Latitude (to which the place from the *Line* we were much becalmed) we had fair weather, and a conſtant Wind between W N W and W *S* W. all along to the Cape (and ſo it was moſt commonly;) and I have therefore noted the weather in the former Voyage, becauſe it was un-uſuall; in that vaſt ſpace between *Rio de la Plata* and the *Cape* the wind being all the year Weſterly. But about the *Cape* from the end or middle of *September* to the beginning of *April*, the winds are variable as in *England*. The reſt of the year they are Weſterly, and intolerable ſtorms.

* *This Obſervation of the* bitter Cold *in the Southern Latit. of between* 35. *and* 36. *degrees may be referred to thoſe related by Mr.* Boyle *in his* Experimentall Hiſtory of Cold *p.* 491; *whence he raiſeth this Note:* That the greater or leſſer Coldneſs of the Air in ſeveral Climates and Countrys is nothing near ſo regularly proportioned to their reſpective diſtances from the *Pole*, or their Vicinity to the *Æquator*, as men are wont to preſume.

I can give you no accompt of any thing to the *Southward* of 37. degrees; thoſe few *Ships*, that have adventured to 38, reporting the Winds and *Seas* ſo raging, that none dare goe further.

Some conſiderations touching the variety of Slate, *together with a computation of the Charges in generall, for Covering Houſes therewith; by Mr.* Sam. Colepreſs.

WHereas among the Materials for Building, that for *Covering* is not the leaſt to be conſidered, among the kinds thereof our Contry-ſlate is not to be deſpiſed, and that as well for its *Statelineſs*, as *Permanency*; to which may be added its *Cheapneſs*. The *firſt* whereof needs no better Evidence, than the Eſteem, the ſlated Houſes in or about *London* (though there are not many of them) generally meet with from all, that but take notice of them. For the *Second*, we have ſome ſorts, which by the conjectures of the moſt experienced *Helliers* (or Coverors with *Slat*) have continued on houſes ſeverall hundreds of years, and are yet as firm, as when firſt put up. And for the *third*, the computation of Charges, annexed below, may give ſome hints, as [illegible] eaſily to gueſs at the whole Charge thereby, as compared with Tiling, Leading, Boarding *&c.* (comparatis comparandis.)

I ſhall therefore the leſs ſcruple to offer ſome occaſional Trials (though common ones, for ought I know,) whereby the firm and laſting goodneſs of any *Slate* may eaſily be experimented and without expence.

1. Take the thin cleft ſtone, flat or ſhindle, and ſo knock it againſt any hard matter, as to make it yield a ſound. If the ſound be good and clear, that ſort of ſtone is not crazy, but firm and good. Or

2. If in hewing it does not break before the edge of the *Sects* (the hewing inſtrument of the *Slatters*) you may not much doubt of the firmneſs of the *Slat*. But

3. If after it hath been exactly weighed (and the accompt thereof laid by) it be put, and for 2. 4. or 8. hours left to remaine all under water in a veſſel; and afterwards taken up

and wiped very clean with cloaths, if then it weigh more than before, 'tis of that kind, which imbibes water, and therefore not ſo fit to endure any conſiderable time without rotting the laths and timber.

4. Theſe Stones may be pretty well gueſſed at, whether they be of a cloſe or looſe texture, by their *Colour*: For the *overblackiſh Blew* is apteſt to take in water; but the *lighter blew* is alwayes the firmeſt and cloſeſt. To which may be added the *Touch*; for, a good ſtone feels ſomewhat hard and rough; whereas an open ſtone feels very ſmooth, and as twere, oily.

5. Place your Stone longways perpendicular in the midſt of a Veſſel of water (no matter, how ſhallow the water be, ſo it exceed halfe a foot depth;) and be ſure, the upper un-immerſed part of the Stone be not accidentaly wetted by the hand, or otherwiſe; and ſo let it remaine a day, or halfe a day, or leſs. If it be a good firme ſtone, it will not draw (as they ſpeak) water above half an inch above the level of the water, and that perhaps but at the edges only, the parts of which might be ſomewhat looſen'd in the hewing. But a bad ſtone will draw water up to the very top, be the ſtone as long as it will, all over.

As for the Charges of Covering Houſes with Slate, they may be thus computed.

	ſh.	d.
1000. of *Efford ſmall blew* at the ſhips ſide in Plimouth harbor	5	6.
1000. of *Efford large blew*	9	9.
1000. of *Can* pelmel	7	0.
1000. of *ſmall blew* of other Quarries	4	0.
1000. of *large blew*	8	0.
3000. of ſmall blew, accompted 2. Tuns in carriage by water		
1000. of large blew, 1. Tun		
3000. of ſmall will cover 1. *Poole* of work at the fifth pin plaine.		
Every Poole of work is either 6. foot broad and 14 foot up, on both ſides, or 168 foot in length, and one in breadth.		
3000 of large will cover 2. Pooles of plain work		

Hewing

	ſh.	d.
Hewing of all ſorts of plain pelmell *per* 1000 ——	1 ——	6.
Pinning *per* 1000 8d: Pins *p* 1000: 8d ——	1 ——	4.

Three buſhels (*Wincheſter* meaſure) of good Lime will take 6. buſhels of freſh water ſand, and ſerves to lay on one Poole of work; though much leſs may ſerve the turn.

300 of lathes to every Poole of work.

1000 of Lath nailes to every 300 of Lathes.

An able workman may
- lath 1. poole of work
- lay on 2000 or more of ſlate
- hew 1500 plaine
- pin 4000

by the day.

Chequer-work conſiſts in Angles, Circles and ſemi-circles *&c.* which requires no common skill, and time in hewing and laying.

It is worthy obſervation, that if a ſide-wall happen to take wett by the beating of the weather, or the like, when nothing elſe will cure it, our kerſeing with Slate (which is much uſed in the curious fronts of houſes, eſpecially in Townes) will quickly remedy it.

Some Obſervations

Concerning the odd Turn *of ſome* Shell-ſnailes, *and the* darting of Spiders, *made by an Ingenious Cantabrigian and by way of Letter communicated to Mr. I.* Wray, *who tranſmitted them to the Publiſher for the R. S.*

Sir, I Can deny you nothing, and you may doe what you pleaſe with the Notes I ſend you. You would know of me (you ſay) what I have obſerved concerning the *Odd Turn* of ſome *Shell-ſnailes* with us in England, and the *Darting of Spiders*.

I will tell you then of the *firſt*, that I have found two ſorts of them, eaſily to be diſtinguiſht one from the other, and from all beſides, becauſe the *Turn* of the wreaths is from the right hand to the left, contrary to what may be ſeen in common Snailes. They are very ſmall, and might therefore well eſcape thus long the more Curious Naturaliſts; neither of them much exceeding, at leſt in thickneſs, a large Oat-corne.

The *firſt* I thus deſcribe: The open of the ſhell is pretty round, the ſecond turn or wreath is very large for the proportion, and the reſt of the wreaths, about the number of ſix, are ſtill leſſen'd to a point. This Turben or Conical figure is well neare a quarter of an inch; the colour of the ſhell is duskiſh, yet when the ſhrunk animall gives leave, you may ſee day through it, and then it is of a yellowiſh colour. Theſe ſhells are extreame brittle and tender, ſo that I cannot ſend them in a Letter: You may gueſs at the figure, if I tell you, they are ſome-thing like thoſe of *Aldrovandus de Teſtaceis*, markt p. 359. *Turbinum levium.*

Of the *ſecond* ſort I ſend you incloſed at a venture halfe a dozen; (you ſee, in that I can ſo plentifully repair the loſs of the former, that they are not very rare; (they ſeem to be much ſtronger and thicker ſhell'd; they are well near half as long again as the other, and as ſlender; they have the exact figure of Oat-corn, being as it were pointed at both ends, and the middle a little ſwelled. The open of the ſhell is not exactly round there being a peculiar *Sinus* in the lower part thereof. I think, you may number about 10. Spires, having their turn from the right hand to the left. The colour of the Shell is of a dark and reddiſh brown.

There are two ſorts of this make deſcribed, and with their reſpective Cutts, in *Fabius Columna*; but ours agree not with them in any thing more than the odd Turn: though 'tis true, that the other, the third there deſcribed, and call'd by him *Cochlea Terreſtris turbinata et ſtriata*, is very frequent in the road 'twixt Canterbury and Dover, and likewiſe in ſome wooddy parts of the Woles in Lincoln-ſhire. There are odd differences in this very Snaile very remarkable, as its having but one pair of horns (if I miſtake not,) as alſo a hard ſhelly cover; its manner of wearing that cover &c. which I leave to another opportunity and place.

And to return to our two now deſcribed Snailes, they, when they creep, lift up the point of their ſhells towads a perpendicular, and exert with part of their body two pair of horns, as moſt of their kind doe.

In *March* they are ſtill to be found in paires, *Ariſtotle* affirmes all theſe kind of creatures to be of a *ſpontaneous* birth; and no more to contribute to the production of one another, than Trees, and therefore to have no diſtinction of Sex. I have no reaſon to ſubſcribe to his authority, ſince I have ſeen ſo many of them pair'd, and in the very act of Venery. That they engender then, is moſt certain; but whether thoſe, that are thus found coupled, be one of them male, and the other female, or rather, as you obſerv'd, and publiſhed to the World in the *Catalogue of Plants* growing Wild about *Cambridge*, that they are both male and female and do in the act of generation both recieve into themſelves, and immit a like *penis* (as it ſeems probable to any man that ſhall part them) I leave to further and more minute diſcovery to determine.

Moreover, we find in *Ariſtotle* a Circle of other parts, but of theſe no mention at all. However the Romans knew ſomething extraordinary of this kind of Animals, that made them ſo choice of them, as to reckon them among their moſt delicate food, and to uſe all care and diligence to breed and fat them for their Tables at large deſcribed to us by *Varro*. Their taſt and reliſh is none, methinks, of the moſt agreeable.

Of late, comparing *Buſſy's Hiſtoire Amoureuſe de Gaule* with *Petronius Arbiter*, out of whom I was made to believe, he had taken two of his Letters word for word, beſides other Love-intrigues; I found, in running him over, what ſatisfied me not a little in this very ſubject of *Snailes*; *viz.* That theſe very Animals, as well as other odd things in Nature, as *Truffs*, *Muſhroms*, and no doubt too the *Coſſi* or great Worms in the Oak (another *Roman* dainty) were made uſe of by the Antients to incite Venery. You'l there find, that the diſtreſſed and feeble Lover prepares himſelf with a ragouſt of Snailes necks (*cervices Cochlearum*;) and indeed in this part it is that theſe ſtrange *penes's* are to be found.

Mr. *Hook* does as it were promiſe the Anatomy of this Inſect. It were ſurely worth his pains, and the Learn'd World would be obleiged to him for a piece of this nature; nothing, accurately done of the inward part of any inſect, being yet publiſht*.

---

* *When this was written*, Malpighius de Bombyce *was not yet publiſht.*

Theſe Snailes are to be found frequent enough under the looſe bark of Trees, as old *Willows*, and in the ragged clefts of *Elmes* and *Oak &c.* and in no other place elſe, that I could obſerve.

You tell me, that it is generally concluded by Philoſophers, That the reaſon of the uſuall *Turn* of *Snailes* from the left to the right, is the like motion of the Sun, and that eſpecially more Nord-ward, there having not been hitherto diſcovered any in our parts of the contrary Turn to the *Sun's* motion. But this is not the only caſe, where they are out, who conſult not the *S*tores of Nature, but their own phancy. What I am further about to tell you concerning *Spiders*, is as evident an Inſtance againſt them.

The *long Threads* in the Air in *S*ummer, and eſpecially towards *September*, have been a ſtrange puzel to the wiſer World. It would divert you, though you know them as well as I, if I here reckoned up the ridiculous opinions concerning them; but I omit them, and proceed to tell you the certain and immediate Authors of them, and how they make them.

~~I ſay~~ then, that all *S*piders, that ſpin in a thread, (thoſe, which we call *Shepherds* or long-legg'd *S*piders, never doe;) are the makers of theſe threads, ſo much wondred at, and in ſuch infinite quantities every where.

I ſent you the laſt *S*ummer a Catalogue of *thirty* ſorts of *S*piders, that I had diſtinguiſht here with us in England; and I muſt confeſs, I had well near compleated that number, with many other Experiments concerning them, before I diſcovered this ſecret. You muſt not expect here from me any thing more, than what you demanded of me; for as for other Experiments, I reſerve them till our meeting.

I had exactly mark'd all the ways of Weaving, uſed by any ſorts of them, and in thoſe admirable works I had ever noted that they ſtill let down the Thread, they made uſe of; and drew it after them. Happily at length in neerly attending on one, that wrought a nett, I ſaw him ſuddainly in the mid-work to deſiſt, and turning his taile into the wind to dart out a thred with the violence and ſtreame, we ſee water ſpout out of a *S*pring: This thread taken up by the wind, was in a moment emitted ſome fathoms long, ſtill iſſuing out of the belly of the animal; by and by the Spider lept into the air, and the thread mounted her up ſwiftly.

After this firſt diſcovery, I made the like Obſervation in almoſt all the ſorts of Spiders, I had before diſtinguiſhed; and I found the Air filled with young and old ſailing on their threads, and undoubtedly ſeizing Gnats and other Inſects in their paſſage; there being often as manifeſt ſignes of ſlaughter, as leggs, wings of Flyes *&c.* on theſe threads, as in their webbs below.

One thing yet was a wonder to me, *viz.* That many of theſe threads, that came down out of the Air, were not ſingle, but ſnarled and with complicable woolly locks, now more now leſs; and that on theſe I did not always find ſpiders, though many times I had found two or three upon one of them: whereas when they firſt flew up, the thread was ſtill ſingle, or but little tangled, or, it may be, thicker in one place then another. In the end, by good attention I plainly found, what ſatisfied me abundantly, and that was this; That I obſerved them to get to the top of a ſtalk or bough, or ſome ſuch like thing, where they exerciſe this darting of threads into the air, and if they had not a mind to ſaile, they either ſwiftly drew it up again, winding it up with their fore-feet over their head into a lock, or break it off ſhort, and let the air carry it away. This they will doe many times together, and you may ſee of them, that have chains of theſe locks or ſnarled thread before them, and yet not taken flight.

Again, I found, that after the firſt flight, all the time of their ſailing they make locks, ſtill darting forth freſh ſupplies of thred to ſport and ſaile by.

It is further to be noted, that theſe complicated threads are much more tender, than our houſe-webbs.

In Winter and at Chriſtmas I have obſerved them buſy a darting, but few of them ſaile then, and therefore but ſingle threds only are to be ſeen; And beſides, they are but the young ones of laſt Autumns hatch, that are then employed; and it is more than probable, that the great ropes of Autumne are made only by the great ones, and upon long paſſages and Summer weather, when great numbers of prey may invite them to ſtay longer up.

But I ceaſe to be tedious: I have many Experiments by me to ſatisfy many doubts, that may be made, *viz.* of the infinite number of theſe Inſects, and their numberleſs Increaſe; and beſides, how ſtrangely they are able to furniſh and huſband great quantities of matter out of ſo ſmall a bulk *&c.*

You may expect all from me after another ſummers leiſure, which at leaſt I think neceſſary to confirm to me theſe; and other things concerning their *Generation* and *Poiſon*. What I have ſaid at preſent, is ſuch as I haue certainly obſerved; and you may take the Truth of theſe Obſervations for excuſe of the ill Texture of them.

An Accompt of ſome Books.

I. GEORGII SINCLARI ARS NOVA & MAGNA GRAVITATIS *et* LEVITATIS *Roterodami in* 4° *A.* 1669.

THe Argument of this Book is the *Spring* and *Preſſure of the Air*, together with ſome Conſiderations touching the *Weight* and *preſſure* of *Water*, as alſo concerning a *Vacuum*, the effects of *Pumps*; item *Pendulums*, *Hygroſcopes &c.*

Whether the Doctrine or Experiments, here deliver'd, be *new* and *unheard* of (as the Author is pleaſed to think, they for the moſt part are) we leave to the well-read and Intelligent to Judge. Only we find ourſelves obliged to take notice that that excellent Treatiſe of the Honorable *Robert Boyle*, entitled, *New Experiments Phyſico-Mechanicall*, touching the *Spring of the Air* and its *Effects*, was printed *two* years before that time, about which the Author of this Book ſaith, in his *Preface to the Reader*, he came to *London*, and there committed his then un-printed papers to the Cenſure of the Philoſophical Colledg there, meaning the *Royall Society*, of whom he complains in the ſaid *Preface*, pag. 2. that he expected an Anſwer from them for almoſt two years in vain; adding, that he afterwards found, in divers Books printed in *Engliſh*, many things taken out of his Manuſcript.

But to undeceive the Reader in this particular, we ſhall *firſt* deſire him, to compare the *date* of the Edition of Mr *Boyles* Book above-mentioned with that of the Time of this Authors viſiting *London*, and there expoſing his *Manuſcript*; that done, it will eaſily appeare, which party hath the priority in the Explication of this Doctrine touching the Air: where it muſt not be left un-mentioned, that Mr *Sinclair*, when he was in *London*, in his viſits of Mr. *Boyle* diſcourſed much with him on that ſubject, and by his own acknowledgment, then made to that Gentleman, recieved much light from him concerning the ſame. *Secondly*, we ſhall take notice, that 'tis ſo great a miſtake, that this Author commended his Manuſcript to the Judgment of the R. *Society*, that 'tis not ſo much as mention'd any where in their Regiſter-book, that ſuch papers came ever before them (which yet is their conſtant and careful practice to doe of all things of that nature;) to which we muſt adde, that the perſon with whom he left thoſe Papers of his, Sir *Robert Moray* (perhaps with a deſire to recommend them to that Illuſtrious Body) affirms, that he did not at all judg them proper to be exhibited there, becauſe they ſeem'd to him to containe nothing new or extraordinary.

II. *OBSERVATIONES MEDICÆ*, Mich. Leyſeri, Henr. a Moinichen, Mart. Bogdani, Jac. Seidelii, *è Muſæo* Th. Bartolini *Hafniæ in* 8°.

Though theſe Obſervations have been abroad theſe ſeveral years, yet coming but lately to our view, we could take no ſooner notice of them. Divers are not inconſiderable; e. g. Of a Pleuriſy, ending in an Abſceſs in the Thigh: Of an Abſceſs in the Thigh evacuated by Vrine: Of a great clew of wormes voided by crude Mercury taken inwardly: Of a Pleuriſy cured without Blood-letting: Of the Bones of a *fœtus* drawn out of the Mothers belly, ſhe ſurviving and bearing ſeveral children afterwards: Of the opening of an *Vterus* cloſed from the birth: Of a bigg Stone found in the Emulgent veins of a Boy of 9. years old: of a Pin ſwallow'd and breaking out of the Thigh 4. years after: Of a Noſe cut off by the hand of Juſtice, and happily ſet and healed on again, by receiving it, when it fell off, into a warm loaf of bread cut in the middle, and ſo ſowing it on: Of a Hen, bringing forth 5 well-formed and live chickins immediately out of her belly, which kill'd her: Of an odd heat in the extreameſt parts of the body, whilſt the intermediat ones betwixt them and the heart were very cold: Of a Quartan cured by drinking very new Beer, and ſweating largely upon it: Of an Eye taken out of the Head of a living man, which being examin'd had all its humors converted into a tallowy matter: Of ſtrange Convulſion-fits, accompanied with vomitings of odd matter, happily cured: Of an unuſual caſe of Melancholy, in which the Patient abhorred moſt kinds of meat, drink, veſſels, and almoſt all people, fancying them to have toucht or been toucht by Epileptical perſons: Of a Stone generated in the Tongue: &c.

Having inquired of an obſerving Correſpondent, living in the Country, Whether he had met with any ſuch Inſtances as was mentioned above, of a *Viviparous* Hen, he returned this Anſwer, that at *Wackton* in *Norfolk*, 2. or 3. years ſince, there was a Hen, which bigg with Eggs, upon ſome account could not lay, but after a time dyed; and then being opened, there was found in the *Ovarium* a perfect chick, which was offered to a Phyſitian in thoſe parts to preſerve.

III. *OTTONIS TACHENII HIPPOCRATES CHYMICUS.* Venetiis *in* 12°.

And this Author, though printed 2. or 3. years agoe, came not to our knowledge, till now: He in this Tract, endeavours to juſtify the Antients, blamed by *Zwelfer* in his *Pharmacopœa Auguſtana* for having committed ſeverall faults in the preparation of a certain *Salt* call'd *Theriacal* becauſe extracted out of Vipers and divers other Ingredients compoſing *Theriack*. And having done this, he thence takes occaſion to treat of the nature of *Salts*, eſpecially of the *Alcaly's* and *Acids*, which he, with ſome other Chymiſts, holds to be the firſt Principles of all mixt Bodies. And being perſwaded, that *Hippocrates* was alſo of this opinion, and a great Chymiſt too, he entitles this Book *Hippocrates Chymicus*.

Though the Salt *Alcaly* properly ſignifies that Salt which is drawn out of the Aſhes of an *Ægyptian* herb, named *Kaly*; yet Chymiſts take it in a larger ſenſe, and underſtand by that word all the Salts, which, like that of the ſaid herb, draw and impregnate themſelves with *Acid* ones. To this Salt our Author refers almoſt all the Operations of Nature, and having examined its proprieties, relates divers not Un-curious Obſervations concerning it.

For Example: That nothing pierces ſo much as *Alcaly's*, and that therefore Nature hath ſtored the Sweat of Animals ſo plentifully with it. For, that the ordure, which continually gathers on the skin, would ſoon ſtop the pores of it, if the ſweat were not furniſht with ſome efficacious diſſolvent to open and pierce them. Where he obſerves, that the beſt liquored Boots, and ſuch as are water-proof, will be quickly pierced by the ſweat of Horſes; adding, that though Riding Poſt he had, to avoid that inconvenience, rubbed his Boots with a Vernice, which reſiſted even to *Aqua fortis*, yet the ſweat of the Horſes, he rode on, diſſolved that fence after the ſecond day of his voyage.

Next, he holds it to be an error, to uſe *Spirit of Vitriol* for Whitening the Teeth, Experience ſhewing, that from the mixture of an *Alcaly* and the *Spirit of Vitriol* there reſults a yellow, and that there is an Alcaly continually tranſpiring out of the Gumms, as of all the other parts of the Body; whence it muſt follow, that the Spirit of Vitriol employed to rubb the Teeth, when mixt with that Salt, muſt tinge them of the ſame colour.

Then he affirms, that wood *rotten* hath no Alcaly in it, and that it rots not but upon the account of the exhaling of that Salt. Whence 'tis *ſaith he*, that the *Venetians*, to harden the Timber deſign'd for building of Ships, ſink it green in water, and there leave it many years; which is the cauſe, that the Alcaly having been hindred from exhaling, the Timber rots not, and becomes as hard in a manner as ſtone.

We cannot pretermit taking notice, that this Author finds occaſion in this Book to explain the way, by which the famous *Turnheiſſer*, a German Chymiſt, made that celebrated Nail, half Gold and half Iron, which is ſhew'd at *Florence*, in the Repoſitory of the Great Duke of *Tuſcany*. 'Tis ſaid, that that Chymiſt, having in the preſence of that Prince immerſed in a certain Oyle the one halfe of a Nail, which appear'd to be all Iron, that part, which touched the Oyle, was inſtantly found to be good Gold. Several perſons having examin'd this Nail, and ſeeing the Gold and Iron exceeding well conjoyned, were perſwaded, that that could not be effected but by a true change of one of thoſe two metals into the other, believing it impoſſible, they could be ſoder'd together. But the Author of this Book maketh that a very eaſy thing, if the Iron be before prepared after a certain manner, which he teacheth; and he pretends, that that was the whole Secret of *Turnheiſſer*, the reſt being nothing but illuſion. For, after he had by that means ſodered together a piece of Gold with halfe a Naile, he knew ſo well to give the color of Iron to Gold, that men believed, that the whole Naile was of Iron; and having afterwards put this Naile into the fire, and held it in the Oyle to take off that colour, he made appear that Gold, which was hid before.

IV. *TH. BARTHOLINI Diſſertatio de CYGNI ANATOME, nunc aucta à CASP. BARTHOLINO F. Hafniæ in 8o. A. 1668.*

IN this Diſcourſe the Author chiefly obſerves the wonderfulneſs of the internall fabrick of this Stately Bird; and more eſpecially of the admirable ſtructure of its *Wind-pipe*; which is ſo framed, that together with the *Oeſophagus* or *Weaſand* it reaches down to the *Sternum*, into which, as a ſafe caſe, it winds it ſelf, and being gone down to the bottom of that cavity is turned up again, and gets out of the ſtreights of the *Sternum*, and climbing up the intermediate clavicles, on which it leans as on a baſe, it bends to the *thorax*. But before it comes to the *Thorax* and the *Lungs*, it forms a kind of *Larynx* with an *Os Hyoides*, covered with a large membrane, and reſembling a muſical pipe, wide above, but with a narrow ſlit, and ſtreight and depreſſed below. Under which *Larynx*, before the Wind-pipe enters into the Lungs, it is divaricated into two branches, like unto *bronchia* thicker in the middle, but narrower where they are near the Lungs: In which particular it differs from the human *Arteria aſpera*, which, 'tis true, is alſo divided into branches, but not before it be entred into the Lungs.

After this deſcription of the ſtructure of this Organ he conſiders the fitneſs of its contrivance for ſuch a Reſpiration, as was requiſite for an Animall, that by long diving and ſinking its neck to the bottom of waters was to find its food.

V. ÆGIDII STRAVCHII BREVIARIVM CHRONOLOGICVM. *Witebergæ in* 12°.

VI. *ABREGE CHRONOLOGIQVE DE L'HISTOIRE SACREE et PROPHANE, par le P.* Labbe *de la Comp. de Jeſus, Paris. in* 12. *in* 5. *Volumes.*

WE put theſe two Books together, becauſe of the likeneſs of their Argument; and we eſteem alſo, that both theſe may deſerve to be Joyned to and compared with, that of Mr. *Beverige*, of which an Accompt was given in the Tranſactions of *May* laſt.

The *former* of theſe two is divided into two parts, a *General* and a *Particular*.

The *General* conſiders Time in general, and its various denominations and Characters, and eſpecially explains that common Receptacle of all *Epocha's*, the *Julian Period*, enlarging upon its Uſes and Advantages.

The *Particular* conſiders time in particular, demonſtrating the certainty of *Epocha's*, and enumerating the *Calendars* of the ſeveral Nations.

The *latter* Author, conſidering with himſelf, that of the writers of Chronology, ſome have contented themſelves to teach only the Precepts thereof; others, to reform the dates of it, and to marke the Characters of Times, without rehearſing the conſiderable paſſages of them; others on the contrary confounding Chronology with Hiſtory, have recited the remarkable Events, without much troubling themſelves about the time, wherein they hapned; this Author, I ſay, hath attempted to joyne them altogether in this Work. And,

Firſt, He gives an Introduction, in which he explains, what is the Indiction, the Cycle, the Epocha, and all the other terms of Chronology.

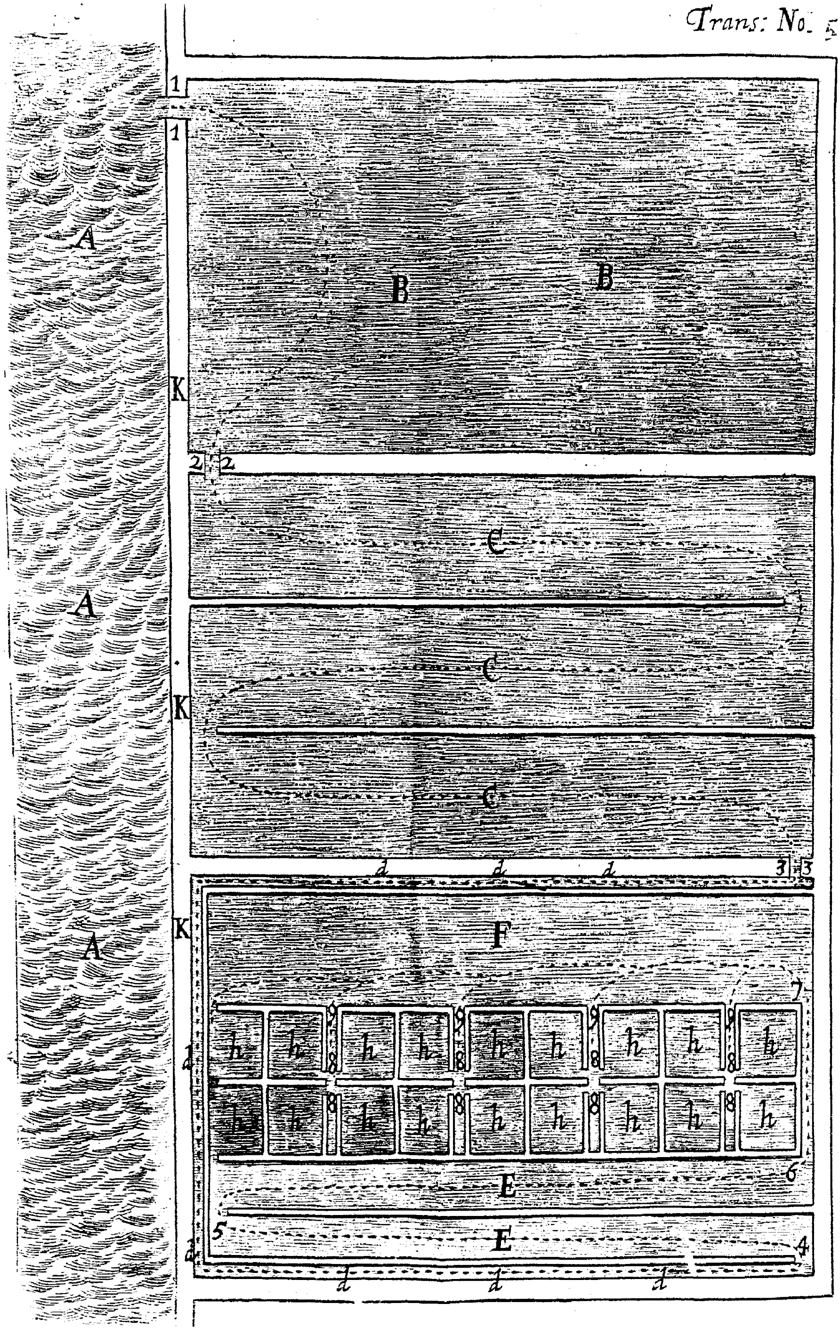
Secondly, Foraſmuch as the *Epocha's*, whence we begin to reckon the Years, are the foundations of Chronology, he treateth accurately of the Year of our *Saviours Nativity* and *Death*; of the *Years* of the *Kings of France* of the firſt and ſecond Race, and of the other celebrated *Epocha's*.

Thirdly, He delivers in ſhort all the more remarkable paſſages of every Year ſince the Creation of the World till the Year 1666. indicating the Authors, whence an ampler information may be taken. And to eſtabliſh certain principles of Chronology, he placeth at the beginning of all Years the Names of the Conſuls, Cycles, Indictions, Eclipſes, and all the other Characters, that diſtinguiſh the Years from one another. And he often does not content himſelf with marking the *Year*, in which the more notable things have hapned, but he adds alſo the *Month* and *Day*, eſpecially in the latter Ages; which is a great relief upon many occaſions.

Fourthly, He hath a particular Diſcourſe, wherein he examineth, in what time *Dido* lived, and ſhews, that ſhe was dead before the Birth of *Æneas*, againſt the opinion of a modern Author; and conſequently that whatſoever *Virgil* hath ſaid of the Marriage of *that* Queen with *this* Prince, is fabulous

Printed by T. N. for *John Martyn* Printer to the
Royall Society, and are to be ſold at the *Bell*
a little without *Temple-Bar*, 1669.

Trans: No. 5


1
1
A
B
B
K
2
2
C
A
C
K
C
d
d
d
3
3
K
F
A
7
h
h
h
h
h
h
h
h
h
9
9
9
9
8
8
8
8
h
h
h
h
h
h
h
h
h
d
6
E
5
E
4
d
d
d
d
d

Numb. 51.

PHILOSOPHICAL TRANSACTIONS.

September 20. 1669.

The Contents.

The Proceſs uſed in France *of making* Sea-ſalt *by the Sun. An Anſwer to ſome Inquiries about the late Eruption of* Mount Ætna. *An Account of two Books:* I. *DISCOURS de M. STENON ſur L' ANATOMIE du CERVEAU* II. *The former Accompt of Dr Witties ANSWER to HYDROLOGIA CHYMICA enlarged: Where the ſanative vertue of the* Scarborough Spaw *is aſſerted from long experience; and on that occaſion the Healing performances of many other Waters, both in England and elſewhere, diſcourſed of; together with their particular Cures, Ingredients, Mixtures, and the Wayes of Analyſing them; as alſo the Neceſſity of uſing them or moſt of them at the Spring-head, &c.*

An Extract of a Letter

Containing the whole Proceſs, uſed in France *for making* Sea-Salt *by the Sun; communicated to the Publiſher in French, by an Ingenious Dr of Phyſick of that Nation, reſiding near the chief place, where 'tis practiſed; and Engliſhed as follows:*

Sir,

I Can at preſent acquit myſelf but of one of the Commiſſions, you gave me when I took my leave of you, referring the other to more leiſure. And I herewith ſend you the Plan * of our Salt-making Mariſhes,

* *See the Figure.*

together with the *Way* of making our Salt. If there be any thing, I have forgot, or related obſcurely, give yourſelf only the trouble of advertizing me of it, and in my next I will add or cleer it.

AAA. is the Sea.

II. the Entry, by which the Sea-water paſſes into B B.

B B. the firſt Receptacle; in which the Water is kept 20. inches deep.

C C C. the ſecond Receptacle, where the Water maketh three turnings, as you ſee, and is 10. inches deep.

22. the Opening, by which the firſt and ſecond Receptacle have communication one with another.

E E F. the third Receptacle, which is properly called the Mariſh.

dddddd. is a Channel very narrow, through which the Water muſt paſſe before it enters out of the ſecond Receptacle into the third.

33. is the Opening, by which the Water runs out of the ſecond into the third Receptacle.

The pricks, you ſee in the Water throughout the whole *S*cheme, doe mark the courſe and turnings, which the Water is forced to make before it comes to *hhhhh*, which are the places where the *S*alt is made.

hhhhh. are the Beds of the Mariſh, where the *S*alt is made; and in them the Water muſt not be above an inch and an half deep. Each of theſe Beds is 15 foot long and 14 foot large.

99999. are the little Channels between the Beds.

88888. are the Apertures, by which the Beds receive the *S*ea-water after many windings and turnings.

When it raines, the openings 22, 33. are ſtopp'd, to hinder the Water from running into the Mariſh mark't E E F. Unleſs it rain much, the rain-water doth little hurt to the Mariſh; and although it rain a day or a night, we doe not let the water which is in the Mariſh run out, the heat of the *S*un ſufficiently exhaling ſuch Rain-water, if, for example it be not above an inch high. Only, if it have rain'd very plentifully that day, no *S*alt is drawn for the 3. or 4. next-following days. But

If it rain 5. or 6. days, the people are then neceſſitated to empty all the Water of the Beds by a peculiar Channel, conveighing it into the Sea; which Channel cannot be opened, but when 'tis Low water. But 'tis very ſeldome, that it rains ſo long as to conſtraine men to empty thoſe Beds.

'Tis obvious, that the hotteſt years make the moſt Salt; where yet it is to be noted, that beſides the heat of the Sun, the Winds contribute much to it, in regard that leſs Salt is made in Calms, than in Windy weather. The Weſt-and North-weſt Winds are the beſt for this purpoſe.

Our Country-people draw the Salt every other day, and they draw out of thoſe Beds, mark't *hhh*, every time more than an hundred pound weight of Salt.

In the hotteſt part of the Summer there is Salt made even during Night.

The Inſtruments uſed to draw the Salt, have many ſmall holes, to let the Water paſs, and to retain nothing but the Salt.

According to the *Quality* of the Earth or Ground of the Mariſh, the Salt is made more or leſs White. The Reddiſh earth maketh the Salt more Gray; the Blewiſh, more White: Beſides, if you let run in a little more water than you ought, the Salt becoms thence more White; but then it yields not ſo much. Generally all the Mariſhes require a fat Earth, neither Spungy nor Sandy.

And as to the Whiteneſs of Salt in particular, there are 3. things to be conſidered: *Firſt*, that the Earth of the Mariſh be proper. *Secondly*, that the Salt be made with good ſtore of water. *Thirdly*, That the Salt-man, who draws it, be dextrous. In this Iſle of *Rhe* there are, that draw very dark Salt, and others, that draw it as white as Snow; and ſo it is in *Xaintonge*. Chiefly care is to be taken, that the Earth at the bottome of the Beds mingle not with the Salt. The Salt, we uſe at our Tables, is perfectly white; which is thence, that 4. or 5. hours before the Salt is to be drawn, we draw the Creme, or that Salt which is form'd on the top of the water. The grains of it are ſmaller, than of the other. Generally the Salt of *Xaintonge* is ſomewhat whiter, than ours. I do not well know the bigneſs of the *Sea-Salt* made by Fire; but ours is of the ſize of a Pepper-grain, and of a Cubical ſhape.

The Mariſhes are preſerv'd from one year to another by overflowing them, ſo that the water be near a foot high above the Mariſhes.

There are Mariſhes, that are not ſeparated from the *Sea* but by a ditch of 20. or 30. foot large: others are further diſtant, receiving the Water by Channels, that are made according to the *Scituation* of the Mariſhes. To preſerve this Ditch, it is ſtrengthened with ſtones from the foot to the top, as we uſe to pave ſtreets.

The Timber of the Mariſhes, if it be of good Oak, keeps near thirty years; but there is uſed but little Wood, all the Ditches and Apertures being done with ſtones.

An Anſwer
To ſome Inquiries concerning the Eruptions of Mount Ætna, *An.* 1669. *Communicated by ſome Inquiſitive Engliſh Merchants, now reſiding in* Sicily.

Touching the Forerunners of this Fire, there was, for the ſpace of 18. days, before it broke out, a very thick dark sky in thoſe parts, with Thunder and lightning and frequent Concuſſions of the Earth, which the people make terrible reports of, though I never ſaw nor heard of any Buildings caſt down thereby, ſave a ſmal town or village, call'd *Nicoloſi*, about halfe a mile diſtant from the New Mouth, and ſome ſuch other ſlight Buildings among thoſe Towns, that were after over-run by the Fire. Beſides, it was obſerv'd that the Old top or Mouth of *Ætna* did, for 2. or 3. months before, rage more than uſual; the like of which did *Volcan* and *Strombilo*, two Burning Iſlands to the Weſt-ward. And the top of *Ætna* muſt about the ſame time have ſunk down into its old *Vorago* or hole, in that 'tis agreed by all, that had ſeen this Mountain before, that it was very much lower'd. Other Forerunners of this Fire I have not heard nor met with.

It firſt broke out on the Eleventh of *March* 669. bout two hours before night, and that on the *South-Eaſt-ſide* or skirt of the Mountain, about 20. miles beneath the Old Mouth; and 10. miles from *Catania*. At firſt it was reported to advance 3. miles in 24. hours; but at our being there (*viz. April* 5) when we were come within a ſhort mile of *Catania*, it ſcarce mov'd after the rate of a furlong a day; and after this degree of progreſs it continued for 15. or 20. days after, paſſing under the walls of *Catania* a good way into the *Sea*; but about the latter end of this Month and the beginning of *May* (whether it was that the *Sea* could not receive this matter faſt enough, or rather that the Mouth above did caſt forth a larger quantity) it bent all its force againſt the City; and having wrought itſelf up even with the Walls thereof, over it paſs'd in divers places; but its chief fury fell upon a very ſtately *Convent*, which was that of the *Benedictins*, having large Gardens and other ground betwixt them and the Wall: Which when it had filled up, it fell with all its force on the Convent, where it met with ſtrong reſiſtance, which made it ſwell (as uſually it did, where it met with any Obſtruction) almoſt as high, as the higher Shops in the Old London Exchange, this Convent being built much after that faſhion, though conſiderably bigger. *S*ome parts of this Wall were driven in, whole and entire, almoſt a foot, as appeared by the riſing of the tyles in the midſt of the floor, and bending of the Iron-barrs that went croſs above. And 'tis certain, had this Torrent fallen in ſome other part of the Town, it would have made great havock amongſt their ordinary Buildings, but here its fury ceaſed the 4. of *May*, running hence forward in little channels or ſtreams, and that chiefly into the Sea. It had overwhelmed in the upland-contry ſome 14. Towns and villages, whereof ſome were of good note, containing 3 or 4 thouſand Inhabitants, and ſtood in a very fruitful and pleaſant Country, where the Fire had never made any devaſtation before: but now there is not ſo much as any ſign, where ſuch Towns have ſtood; only the Church and *S*teeple of one of them; which ſtood alone upon an high ground, does ſtill appeare.

As to the matter, which thus ran, it was nothing elſe, but divers kinds of Metals and Minerals, rendred liquid by the fierceneſs of the Fire in the bowels of the Earth, boyling up and guſhing forth, like the water doth at the head of ſome great

River; and having run in a full body for a good Stones caſt or more, the extreamities thereof began to cruſt and curdle, becoming, when cold, thoſe hard porous Stones, which the people call *Sciarri*, having the neareſt reſemblance to huge Cakes of ſea-cole; full of a fierce Fire. Theſe came roling and tumbling over one another, and where they met with a bank, would fill up and ſwell over, by their weight bearing down any common building, and burning up what was combuſtible. The chief motion of this matter was forward, but it was alſo dilating it ſelf, as a Floud of Water would doe on even ground, thruſting out ſeverall Armes, or Tongues, as they call them.

About 2. or 3. of the Clock in the night we mounted an high Tower in *Catania*, whence we had a full view of the Mouth; which was a terrible ſight, *viz.* to ſee ſo great a maſs or body of meer Fire. Next morning we would have gone up to the Mouth it ſelf, but durſt not come nearer than a furlong off, for feare of being overwhelmed by a ſudden turn of the wind, which carried up into the Air ſome of that vaſt pillar of Aſhes, which to our apprehenſion exceeded twice the bigneſs of *Pauls* Steeple in *London*, and went up in a ſtreight body to a farr greater hight than that; the whole Air being thereabout all cover'd with the lighteſt of thoſe Aſhes blown off from the top of this pillar: And from the firſt breaking forth of the Fire untill its fury ceaſed (being 54. days) neither Sun nor Starr were ſeen in all that part.

From the outſide of this pillar fell off great quantity of Stones, but none very bigg, neither could we diſcern any Fire in them, nor come to ſee, where that fiery ſtuff broke out, there being a great bank or hill of Aſhes betwixt it and us.

At the Mouth, whence iſſued the Fire, or Aſhes, or both, was a continual noiſe, like the beating of great waves of the Sea againſt Rocks, or like thunder a farr off, which ſometimes I have heard here in *Meſſina*, though ſituated at the foot of high hils and 60. miles off. It hath alſo been heard 100. miles Nordward of this place, in *Calabria* (as I have been credibly informed,) whither the Aſhes have alſo been carried: And ſome of our ſeamen have alſo reported, that their decks were covered therewith at *Zant*, though its likely not very thick.

Of thoſe Burnt Stones or *Sciarri*, I have ſome by me of divers qualities, and ſhall procure what more I can, to be ſent by the firſt paſſage.

About the middle of *May* we made another Journey thither, where we found the face of things much altered, the City of *Catania* being three quarters of it compaſſed round with theſe *Sciarri*, as high as the top of the Wals; and in many places it had broke over. The firſt night of our arrival a new ſtreame or gutter of Fire broke forth among ſome *Sciarri*, which we were walking upon an hour or two before, and they were as high as to be even with the top of the Wall. It powred itſelf down into the Citty in a ſmall gutter of about 3. foot broad, and 9. foot long of meer Fire, the extremities ſtill falling off into thoſe *Sciarri*; but this ſtreame was extinct by the next morning, though it had filled up a great void place with its *Sciarri*. The next night was another much bigger Channel diſcovered, powring itſelf over another part of the Wall into the Caſtle-ditch, which continued (as we were informed) ſome days after our departure. Divers of thoſe ſmal Rivolets did run at the ſame time into the *Sea*, and it does ſo ſtill at this very day, though faintly.

It was obſerved, that thoſe ſtreams of Fire never grew broader nor viſibly longer, nor moved out of the place, they were ſeen in; which put us a little more to examine their working, and we did conclude, that not only then, but in the fury alſo of its running, it made it ſelf certain cruſted gutters to run in, to keep itſelf, as 'twere from the Air, which by degrees did cool and fix it, as more plainly appear'd above at the Mouth, where, the firſt time of our going thither, we found the *Sciarri* generally thus coold and fixt. And hence alſo it might proceed, that theſe live *Sciarri*, meeting with any bank or high ground, would puff and ſwell up, till they had overcome it; ſo that in many places, eſpecially under the Wals of *Catania*, were Vallys of thoſe *Sciarri*, and the Fire never broke forth, or diſcovered itſelf in thoſe ſtreams, until it had gain'd its hight; for thoſe rivolets ever went declining.

Having ſpent a couple of days about *Catania*, we again went up to the Mouth, where now without any danger of Fire or Aſhes we could take a free view both of the old and new Channel of the Fire,and of that great mountain of Aſhes caſt up. That,which we gueſſed to be the old bed or channel, was a three-corner'd plot of about 2. Acres, with a cruſt of *Sciarri* at the bottom, and upon that a ſmal cruſt or ſurface of Brimſtone. It was hedg'd in on each ſide with a great bank or hill of Aſhes, and behind and at the upper end roſe up that huge mountain of the ſame matter. Between thoſe two banks the Fire ſeems to have had its paſſage. At the upper end in the nook upon a little hillock of cruſted *Sciarri* was an hole about 10. foot wide, whence 'tis probable the Fire iſſued; and it might have had ſeveral other ſuch holes, ſince either cruſted over or covered with aſhes. At the bottom of this hole the Fire was ſeen to flow along, and below it was a channel of fire, beneath that ſurface of *Sciarri*, which being cleft a top for ſome ſpace, we had an eaſy and leiſurable view of the metal flowing along, whoſe ſuperficies might be a yard broad, though poſſibly it carried a greater breadth underneath, the gutter going ſloping. What depth it had,we could not gueſs: it was impenetrable by Iron hooks and other Inſtruments we had. We were very deſirous to have got ſome of this matter at the Spring head, but we could penetrate no more into it, then with ones finger into the palme of the hand. 'Tis likely, that ſome running may have been more yielding, than we found this. From this channel,but eſpecially from that hole above it, iſſued great ſtore of a ſtrong ſulfureous ſmoak, wherewith ſome of our company were at firſt almoſt ſtifled through inadvertency. About once in a quarter of an hour there would riſe a pillar of ſmoak or aſhes, but nothing comparable to the former; which ſeem'd to come from the middle top of that new made Mountain. I confeſs,it was an omiſſion in us, not to goe up to this mountain, being ſo near; but becauſe it was troubleſome and not without danger, the reſt of the company being ſatisfied with what they had already ſeen,would not ſtay to ſee any more.

At this our laſt being at *Catania* we found the people buſy in barricading the ends of ſome ſtreets and paſſages, where they thought the fire might break in; and this they did by pulling down the old houſes thereabout, and laying up the looſe ſtones in manner of a wall, which they ſaid would reſiſt the fire as not being mixt with lime; though it was the great weight and force of that fiery matter in preſſing forward, and not its burning, that overthrew the buildings, as plainly appeared in the Convent of the *Benedictins*, and in the Town-wals, where the great deluge of Fire did pour it ſelf; it not breaking into the City, but pouring it ſelf over the wals, as hath been ſaid.

Unto this very time 'tis ſaid to have run a mile into the Sea, and as much in front, though it was much leſs, when we were there. The ſhore goes gently declining, having at the extremity of the *Sciarri* about 5. fathoms, and about half as much they are above water.

The ſuperficies of the water, for 20. foot or more of thoſe rivolets of fire, was hotter than to endure on's hand in it, though deeper it was more temperate, and thoſe live *Sciarri* ſtill retain'd their fire under water, as we ſaw, when the Surges of the Sea retreated back in their ordinary reverberations.

The general face of theſe *Sciarri* is in ſome reſpect not much unlike, from the beginning to the end, to the river of *Thames* in a great froſt at the top of the Jce above bridg; I mean, lying after ſuch a rugg'd manner in great flakes: but its color is quite different, being moſt of a dark dusky blew, and ſome ſtones or rocks of a vaſt bigneſs, cloſe and ſolid.

But notwithſtanding their ruggedneſs, and ſtore of fire, which we could ſee glowing in the clefts and cavaties, we made a ſhift to ramble over a good part of them; as 'tis ſaid alſo, that people would doe the ſame in its greateſt violence of burning. For as thoſe live *Sciarri*, and thoſe Rivers of fire themſelves were ſo tough and impenetrable as to bear any weight, ſo the ſuperficies of the *Sciarri* might be toucht and handled, the fire being inward, and not to be diſcerned but near hand, eſpecicially in the day time: And 'twas ſomewhat a ſtrange ſight to ſee ſo great a River come ſo tamely forward; for, as it approached unto any houſe, they not only at good leiſure removed their goods, but the very tiles, and beams, and what elſe was moveable.

'Tis obſervable, that none of thoſe, that went to ſee it, when there was little elſe to be ſeen but the cold *Sciari*, but declared to have found it a much other thing, than they imagined, though related to them *viva voce* by thoſe who had formerly been there.

I ſhall add, that the whole country from the very Walls of *Catania* to 20. miles on this ſide is full of thoſe old *Sciarri*, which former Eruptions have caſt forth, though the people remember none ſo bigg as this laſt, or that burſt out ſo low. This Country is notwithſtanding well cultivated and inhabited; for length of time hath either mollified much of thoſe old *Sciarri*, or new mould or aſhes have overgrown them; though there ſtill remains much Country, which, it may be, will never be made ſerviceable.

What is the perpendicular hight of this Mountain, I cannot learn. It cannot perhaps be rightly taken, being ſo ſubject to alter its height and ſhape. But it is a very goodly Mountain to look upon, as one paſſes by Sea to the Eaſt-ward, ſtanding alone by it ſelf, riſing from the very ſhore; and at ſhorteſt paſſage is reckoned 20. miles up to the top, though from *Catania* it hath 30. miles, as before.

An account of two Books

I. *DISCOURS de M. STENON ſur L'ANATOMIE du CERVEAU. A* Paris 1669. *in* 12.

IN the beginning of this Diſcourſe the Author repreſents, that thoſe, who ſearch after ſolid knowledge, will find nothing ſatisfactory in all that hath been hitherto written concerning the *Brain*: that all, which Anatomiſts agree in, is only, that it conſiſts of two Subſtances, a White and a Grayiſh, and that the *former* is continued with the Nerves, that are diſtributed through the whole Body; and the *latter* ſerves in ſome places for a kind of *Cortex* to the *White*, and in others, ſevers the white filaments from one another. But that they are yet ignorant, what thoſe ſubſtances are; in what manner the Nerves are Joyned in the *White*; and how farr their extreamities advance in it; from which diſpoſition yet depends all the diverſity and variety of our ſenſations and motions. And as for the *Ventricles* or Cavities of the Brain, he affirmes them to be no leſs unknown, than its Subſtance; ſome Anatomiſts lodging in them the Spirits; others making them the receptacles of the Excrements of the Brain; and both perplext in aſſigning the ſource and Iſſue of the Excrements, and the Spirits, and the manner of the production of the latter.

Beſides this, he finds a great defect in the way of diſſecting the Brain, and having ſhewed the imperfection in the common ways, he propoſes and recommends that (though difficult one) of continuing the filaments or threds of the Nerves through the Subſtance of the Brain, to ſee, where they paſs, and where they terminate.

Next, he entertains the Reader with an Enumeration of the chief *Errors* of Anatomiſts touching the brain. And here he examins particularly the Syſtemes of Dr. *Willis* and Monſieur *Des-Cartes*. In the *former* he takes ſpecial notice, that the Author thereof lodges the *Common Senſe* in the *corpus Striatum*; the *Imagination* in the *Corpus Calloſum*; and the *Memory* in the *Grayiſh Subſtance* which encompaſſes the *White*. But then he declares, that theſe aſſertions are very obnoxious; for, whereas Dr. *Willis* deſcribes that *Corpus ſtriatum*, as if there mere two ſorts of Streaks or Rays, ſome aſcending, ſome deſcending, he finds, that a ſeparation being made of the *Gray* body from the *White*, thoſe Rays will be found to be all of the ſame nature, that is, they make part of the *White* ſubſtance of the *Corpus Calloſum* which paſſes towards the Marrow of the Back, ſeparated in divers Layers by the intervening of the *Grayiſh* Subſtance. Which being ſo, *ſaith he*, with what certainty can we be made to believe, that thoſe three Operations are performed in thoſe three Bodies? And who can tell us, whether the nervous Fibres have their beginning in the *Streaked Body*, or whether they rather paſs through the *Callous Body* into the *Gray Subſtance*?

In the *latter* of M. *Des Cartes*, he finds, that that Philoſopher hath rather *deviſed*, in his *Treatiſe of Man*, ſuch an Engine, that performs all the actions, Men are capable of, than deſcribed Man, as *really* he is; which he undertaketh to prove by divers inſtances, taken from the *Carteſian* fabrick of the parts of the Brain: in the doing of which our Author ſhowes great dexterity, skill, and accuratenes. And from hence he proceeds,

To

To obſerve the want of exactneſs in the Cutts or *Figures*, hitherto given of the Brain: and although he acknowledgeth, that the beſt Figures, hitherto made of that part, are thoſe of Dr. *Willis*, yet he finds ſeveral faults committed here and there, and conceives, there are many things to be added for making them perfect: which certainly this able Anatomiſt will conſider further, and according to his Ingenuity, as he ſhall ſee cauſe, rectify, if the Author of the Book, reflected on, prevent him not.

Having thus diſcuſſed the hitherto practiſed way of diſſecting the Brain, and the litle light to be derived thence, together with the defectiveneſs of the Figures belonging thereto, he leaveth it to the Conſideration of Judicious men, what faith is to be given to the Explications made upon ſuch unſolid foundations; and that done, he declares, which are the two only ways for attaining the true knowledge of an Engine; *viz. One*, by having the contrivance of it diſcovered by the Author himſelf; the *other*, by taking it in pieces to the very leaſt parts, and examining them all both ſeverally and joyntly. The former not being to be expected, he excites the Lovers of real knowledge to the careful performance of the latter; excuſing in the mean time thoſe two ſorts of perſons, that hitherto have addicted themſelves to Anatomical reſearches, *viz. Phyſitians* and *Chirurgions*, for not having made ſatisfactory diſcoveries by their labors, and alleadging on their behalf their want of time requiſite for this purpoſe; the ill conſequence of which he repreſents to be, that they often undertake to cure a Body, of which they know not the Structure, which is no better, (ſaith he) then if a man would repair or wind up an Engin, the parts of which he is ignorant of. And as for Profeſſors of Univerſities or other Schools, he Judges them not ſo proper for that particular application, and the variety of methods of diſſecting; both which is neceſſary for examining every the ſmalleſt part, and the obſerveables thereof; there being ſometimes required whole years for finding out one onely thing, that perhaps may afterwards be demonſtrated to others in one hour; which he exemplifyes by divers inſtances of Diſcoveries, made by ſome of the modern Anatomiſts.

He concludes his Diſcourſe by recommending the method which ſeems beſt and moſt convincing to him, for making true Diſcoveries in Anatomy; where he adviſeth, that for obtaining the true hiſtory of the parts, we ſhould examine and accordingly draw them in that *S*tate,in which they are found naturally, without at all forcing them; thereby to find, whether the parts are indeed joyned together or ſeparated, and what ſituation is aſſigned them by Nature it ſelf. Where he deſires, that the Anatomiſt would not only be intent upon the part, on which he is for the preſent employed, but alſo reflect upon all the Operations, he hath made before he came to that part, which may have cauſed ſome change or other in the ſame, as to its ſcituation, connexion *&c.* Of which he alſo alledges divers Examples,eſpecialy as to the Brain.

Beſides this exact attention on all the Operations, he further counſels the Change of the *ways* of Diſſecting, and deduceth the ill conſequences of binding ourſelves to certain fixt Laws of diſſecting each part; this benefit reſulting from that Change, that if it doth not always diſcover ſomething new,it lets us know at leaſt, whether we have been deceived in what we have ſeen formerly, eſpecially in things dubious and conteſted. Of the neceſſity of this Change he brings manifeſt proofs; and having done ſo, he alledges the reaſon why he ſays nothing of the *Uſe* of the parts of the Brain,nor of the actions called *Animal*;it being impoſſible to explain the motions,that are made by an Engin, if the artifice of the parts be not known,and thoſe Anatomiſts rendring themſelves ridiculous, that diſcourſe ſo magiſterially of the Uſe of the parts,of which they know not the ſtructure.

Laſt of all, he obſerves, that when all this, he hath diſcourſed of,*is* done,that is but the leaſt of what is *to be* done; in regard that for the acquiring of ſome good Knowledge of the Brain, there muſt be Diſſections and Examinations made of as many Heads, as there are different ſpecies's of Animals, and different *S*tates and Conditions of each kind; ſince that in the *fetus*'s of Animals it will be ſeen,How the Brain is formed; and what could not be ſeen in ſound and entire *B*rains, may be ſeen in ſuch, as have been changed by ſickneſs.

II.Inſtead of the *other* Book,of which we purpoſed to give here

Accompt, we find our ſelves oblieged ſomewhat to enlarge that which was, for want of more leiſure, too curſorily given in *Numb.* 49. of Dr, Witties *Anſwer to Hydrologia Chymica*, concerning the *Scarbrow Spaw.* To do therefore right to this Worthy perſon, we ought among other things to take notice of what he ſaith in his Preface; *That when he firſt publiſhed his Book, he had found the* Scarbrough Spaw, *even in* 20. *years Experience, to be eminently ſucceſsful in the Cure of very many diſeaſes, which had reſiſted all rational Methods, that had been uſed either by himſelf, or others of his Faculty. That now his Practice had been near* 30. *years, and that now he can add ſome conſiderable Cures, which he hath not hitherto expreſſed.*

Now to ſollicit this Learned Doctor and others for theit farther Diſcovery's of Sanative Waters, and to add weight to the Argument; we may obſerve, that A. 1634. Dr. *Thobias Whitaker*, a famous Phyſitian of *Norwich*, Publiſhed in Engliſh a diſcourſe Περὶ Ὑδροποσίας, or Of *Drinking Mineral* Waters; particularly reflecting upon a Mineral Water then diſcovered in *Norfolk*, and producing the Joynt-advice of all Antiquity (as he pretends,) at leaſt of the beſt Writers, namely of *Hippocrates*, *Galen*, *Avicenna &c.* generally againſt all uſe of Mineral Waters either to be taken inwardly, or for any outward application. This Diſcourſe is recmmended by the expreſs approbation and elogies of Dr *William Clement*, Fellow and Regiſter of the Colledge of Phyſitians in London, and by Dr. *Alex. Read* Fellow of the ſame Colledge.

This may give fit Caution againſt the raſh Uſe of ſuch Waters, when ordinary Medicins may be effectual; and to take the advice of ſkilful Phyſitians in the Uſe of them. And for the Poor, which are not able to retain Phyſitians, nor to pay Apothecaries, they muſt abide the adventure of repairing to thoſe kind Fountains, which doe not unfrequently cure, when all other coſtly and tedious Methods doe faile. And *here* they may find the Suffrage of many Curious and Inquiſitive Authors, and the evidence of much Experience: *Here* they may ſee the real and great performances of Cures, and what are the particular Cures, what the particular Ingredients, and what the mixtures, together with the ſeveral ways of Analyſing the Waters *&c.*

As to the Sanative Properties in *general* of many Minerall Fountains (beſides the numerous Experiments of all ſorts of people for many Ages in ſome places, and of late diſcovery in other places) *Dr. Wittie* recites the Judicious teſtimony of *Dr. French* and *Dr Dean* concerning the *Knarſborough Spaw*; Doctor *Jordan* concerning the *Baths* in Somerſet-ſhire; *Dr. Heer's Spadocrene*; Doctor *Frambeſarius* and *Dr. Ryetius* of the *Sauvenir* in Germany, *Dr. Fallopius* de *Therm. Aquis* and the Spaws in Germany and Rome, de *Balneo Aponitano*, and the water at *Corſena*: Of ſuch waters in general, *Paracelſus* and *Helmont*: And this Doctors own deſcription of St. *Mungo's Well* at *Cockgrave.* To which we may now add *Aſtrap*-well in Northampton, lately diſcovered, together with that at *Stall-bridge* in Somerſetſhire, which laſt begins alſo to be in high eſteem for extraordinary Cures of the *Scorbute*, *Aſthma &c.* which, beſides common fame, is (as we were freſhly informed by a worthy friend) atteſted by *Dr. Highmore*, who affirmes alſo upon his own Tryal, that it hath a larger proportion of the Minerals, than *Aſtrap*-water; but that the force holds not, if removed from the Spring-head. And *Dr. Wittie* hath himſelf ſufficiently aſſerted the Vertues of the *Scarborough-Spaw*: and particularly, that it cured the *Aſthma*, *Inveterate Catharrs*, *Hecticks*, *Conſumptions*, *Scurvy*, *Dropſy*, and other diſeaſes, when they ſeemed incurable: That an Alderman of *Hull* (to whom himſelf, and the famous *Dr. Primroſe*, were, 15. years agoe, joyntly Phyſitians for the *Aſthma*) had in few days perfect cure by the Spaw, and is yet living to vouch the teſtimony: So that all the neighbourhood are taught by frequent experience to ſing the old Song of *Claudian*, which he made for his *Aponus*.

Publica morborum requies, commune medentum
Auxilium, præſens Numen, inempta Salus.

And this old Record may put us in mind, that lofty Groves and healing Fountains have been reputed Holy in old times; and we can ſhow the Hoſpitals, which have been long agoe built and endowed on purpoſe to entertain the poor paſſengers in their travels to ſuch waters. This I had not here mentioned, but to introduce our Authors weighty remark; That theſe Waters looſe all their virtues, yea their quantity and bulk alſo, though in Glaſſes, and under the Hermetick Seale, if removed from the Fountain-head; that then they became ſuddenly putrid, ill-colored, looſing the taſt and ſent, and being very noxious, and begetting the Jaundiſe and worſe diſeaſes. The like is affirmed by *Dr French*, that the *Knarsborough* Water expires through Glaſs and the firmeſt Seales. And *Dr. Heer* affirmes of his *Spadocrene*, that by ſuch removals, *illas a communibus nihil diſcrepaſſe, ut quibus ſingulis lagenis aquæ vitrum* (which is gueſſed to be half a pint) *deceſſerat*. He adds; *Decedit etiam quantitati—ſi fons hic alio transferatur—quia ſpiritu turgentia plus loci, quam eo privata, occupare amant.* And *Frambeſarius* reports as much of the *Sauvenir*, that in bottles well ſealed up, there wanted to every *lagena* (flask) one Glaſs of its meaſure (doubtleſs through the loſſe of the volatile Spirits.) Here we want inſtruction, Whether the decreaſe was as well of Weight as of Bulk or Quantity.

Whatever theſe Spirits be, which will neither endure to travel from the place, nor will be confined in any botle, not under any Seal; *Dr Wittie* undertakes to evince by good Proofs, and manifold indications, that theſe *Scarborough* waters have a mixture or tincture of Iron, Allum, Nitre, and probably of a ſmall doſe of Common Salt: Nay, he affirmes punctually (p. 175.) as upon his own Experiment, that 5. quarts of this water contain at the leaſt an Ounce of Minerals, and in dry years, 10. drams; And yet that the uſual doſe for women to remove the Green ſickneſs is 3. quarts of water, and ſometimes more.

He further voucheth his own Trial (p. 179.) that *Knarsborough*-water hath 2. Ounces of Salt in a Gallon, though it be 40. miles diſtant from the Sea: And that he hath found alſo by tryal, the 16th part of the Nothern Sea-water near *Scarborough* to be a body of Salt (an Ounce of Salt for every pint;) and he conceives the Southern Seas to contain a greater proportion of Salt. Here we muſt diſtinguiſh, that the 2. Ounces of Salt above mentioned, to be found in every Gallon of *Knarsborough*-water, belong to the Well there called the *Sulphur*-well: And for the healing properties of the *Sweet well* (as they call the other Well at *Knarsborough*) he refers to the Ingenious and illuſtrious Experiments of Dr. *French* and Dr. *Dean*.

All which being conſidered, we cannot but add, that whoever diſcovers ſuch healing waters, and publickly preſcribes the ſafe and right uſe of them, does really diſtribute larger and nobler Almes, than if he built and endowed a *Savoy*. For this prolongs life, and reſtores health, (which is ſometimes better than life) both to rich and Poor, to Natives and ſtrangers, to Neighbors and Travellors.

We cannot take off our hands here, without annexing our Authors related Experiment of *Carps* (p. 25.) which were taken out of Ponds newly drained, and being put with freſh watter into a *Copper* Brewing-veſſel, to be preſerved but for one night, were all found dead in the morning. This he imputes to the poiſonous ſteams of the Copper communicated to the cold water.

Among the Cauſes of *Hot-Springs*, he doth (p. 181.) alledge a conſiderable remark on an Obſervation, made by the late Lord *Fairfax*, of ſome heaps of White powder, which he found ſweat out of the Earth near *Bath* (in Somerſetſhire,) which being put into the water, makes it hot; as my ſelf (*ſaith the Doctor*) did experience 5. or 6. years after his Lordſhip had taken it up.

As to his laſt Experimental Demonſtrations and Obſervations, How the fall of Rain and Snow may generally and moſt frequently be the cauſe of our pureſt, livelieſt and moſt laſting Springs, they doe all agree moſt punctually in all circumſtances, with the Experiences and Obſervations of an Antient and very Worthy Gentleman, who lives on the ſide of *Mendip-hills*, and hath had his Eyes always from his Youngeſt days upon the faireſt and fulleſt Sources and Amnery's, I ſay not of *Mendip*, but I think I may ſay of this *Iſland*. This Gentleman hath given to a friend of his the Inſtances and Particulars under his own hand, both for the Springs about *Mendip*, and in other parts of England; and hath many other Antient Witneſſes to joyn with him in the ſame Certificate. And yet Dr. *Wittie* attributes much (ſome will ſay, more than enough) to the Converſion of Air into Water in the *Subterraneous Channels*: For the Illuſtration of which he himſelf knew a Sergeant, belonging to *Hull*, who in a *Diabete* did void above 6. quarts or 12. pounds of Urine every 24 hours, for ſome weeks together, till all his Muſculous parts were diſſolved into Urine; the meaſure whereof did farr exceed the weight of his whole Body, and of his Meat and Drink: In all this time he drank not 3. pints of drink in a day. I know not whether I dare alleadg here Sir *Kene'm Digby*'s relation, he recited of the *Nun*, which voided 200 pounds of Water, as from her bladder, every 24. hours, for ſome weeks together: or that Older record of a ſick Maid in *Italy*, who did every day voyd 36. pints or pounds of Urine for the ſpace of 60. days; during which time there were collected 1740. pounds of Urine more than the weight of all her Meat and Drink, that ſhe had taken. *Horum & ſimilium fides penes Authores eſto*.

ERRATA *in* Numb. *50. to be thus corrected*

P*Ag.* 1001. l. 14. *read* Hippocrates. *p.* 1005. l. 1. *r.* as farr as the Tropick. *p.* 1007. l. 25. *r.* (from the Lizard.) *p.* 1009. l. 14. *r.* are not many. ib. l. 20. *r.* hints, eaſily *p.* 1012. l. 14. *r. not very rare.*) *p.* 1013. l. 16. *r.* this kind ib. l. 18. *r.* to breed. ib l. 21. *r.* Hiſtoire *p.* 1015. l. 22. *r.* their head. *p.* 1019. l. ib. *r.* Zwelfer. ib. *r.* Pharmacopæa.

LONDON,
Printed by T. N. for *John Martyn* Printer to the *Royall Society*, and are to be ſold
at the *Bell* a little without *Temple Bar*, 1665.

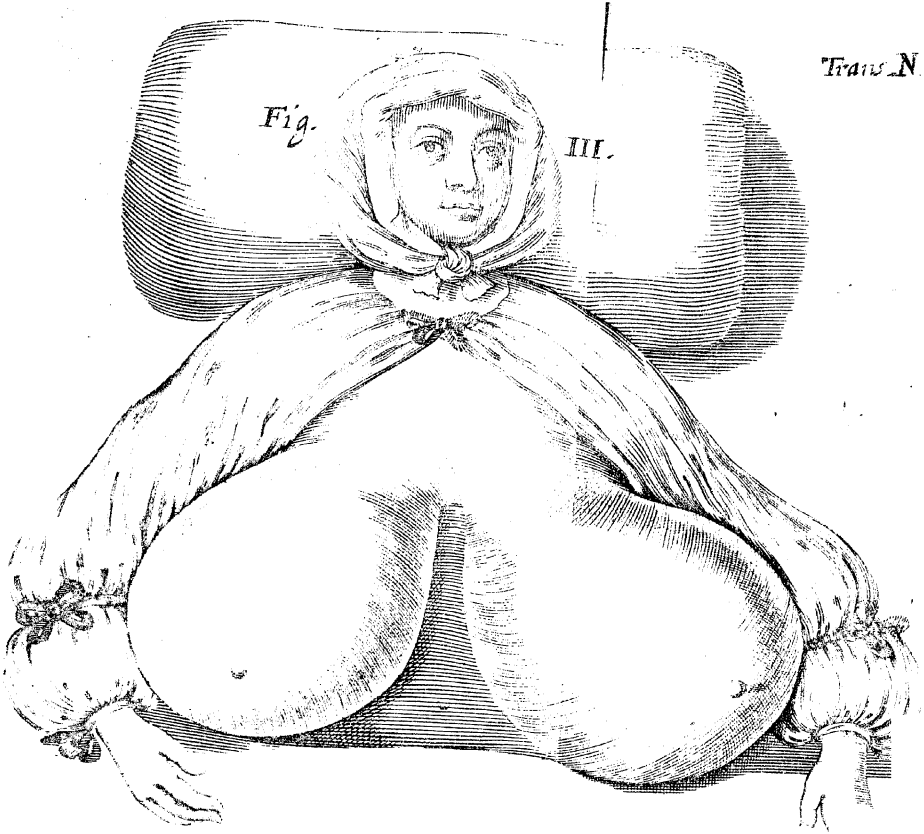


Fig. III.

Fi

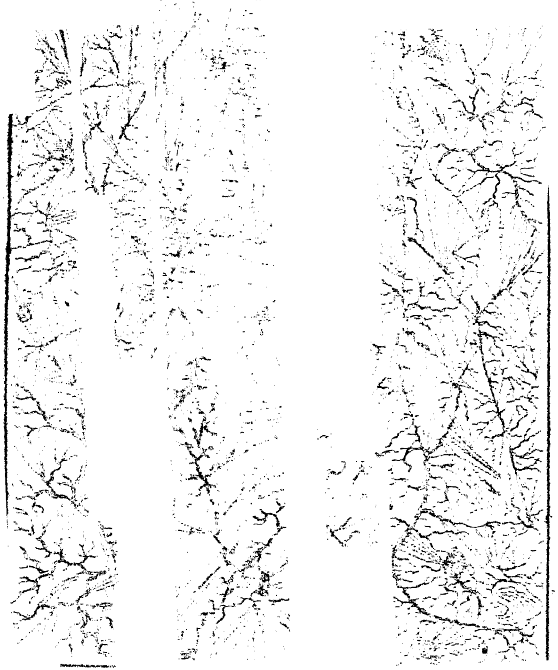
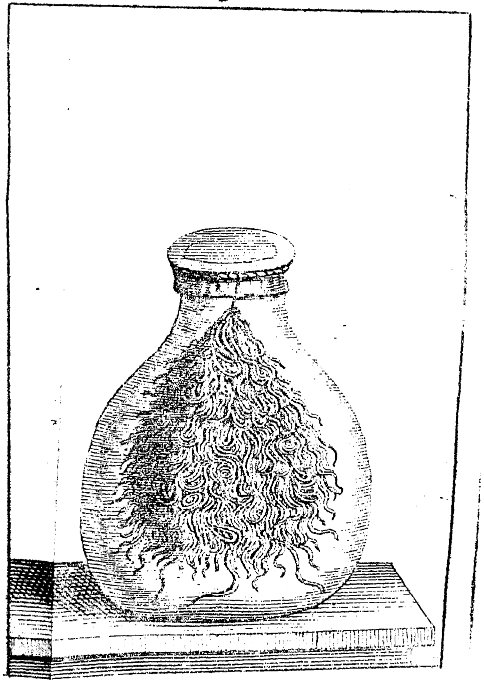


Fig. II.



Numb. 52.

PHILOSOPHICAL TRANSACTIONS.

October 17. 1669.

The Contents.

A particular Accompt of divers Minerals, ſent from the lately burning Mount Ætna, *ſome Obſervations touching ſome of the Organs of Generation. Extracts of two Letters, giving an Accompt of a very ſudden and exceſſive Swelling of a Womans Breaſts. Some Reflections made on the enlarged Accompt of Dr* Witties *Anſwer to* Hydrologia Chymica; *chiefly concerning the Cauſe of the ſudden Loſs of the vertues of ſome Mineral Waters. An Accompt of two Books: I. GUAGING EPITOMISED by MICHAEL DARY. II. HISTOIRE NATURELLE Des ANIMAUX, PLANTES ET MINERAUX, qui entrent dans la Compoſition de la THERIAQUE d' ANDROMACHUS, par M. CHARAS.*

A particular Accompt *Of divers Minerals, caſt up and burned by the late Fire of Mount* Ætna; *mentioning the ſeveral Specimina's, expected in* Numb. 51. *p.* 1031. *from ſome ingenious Marchants of* England, *being upon the place, and ſince come to the hands of the Publiſher, for the Repoſitory of the* R. Society.

SInce it cannot but conſiderably conduce to the rendring a rational Accompt of the Cauſe of ſuch Fiery Eruptions, as are frequently made by divers Mountains, if the matters, by them caſt up, be well examined, in regard that if they are found to be of an eaſily inflamable nature, they may quickly be kindled by ſome falling ſtones, which breaking in pieces may ſtrike ſparks into and ſo ſet on fire ſuch combuſtible matter, they light upon; It was thought, it would not be amiſs, by the favour of our friends in *Sicily*, to procure from the lately flaming Mount there, what Minerals they ſhould be able to get upon the place. And accordingly we received by a ſhip lately arrived from *Meſſina*;

Firſt, a good quantity of *Aſhes*, taken up in divers parts of and about *Ætna*; ſome at the top or mouth of the new made Mountain; ſome a mile off, ſome four, ſome ten miles, ſome but halfe a mile diſtant, and others on the skirts of the ſaid Mount; whereof the four firſt were found to agree well enough with their diſtances, but the two laſt to differ much both from the former and from one another; the former 4. ſorts having been found very dry like duſt, but the two latter being ſtill very moiſt, though in *Sicily* (as we are informed) they have layn expoſed a good while to the hot Sun; beſides that the two laſt differ from one another, in that one ſort of them conſiſts of hard and ſmal lumps, the other, of very ſoft durty grains, yet both moiſt and of a vitriolate taſte.

Secondly, Some of the *Cinders*, which the people of *Sicily* call *Sciarri*, whereof ſome are courſer, taken up at ſome diſtance from the Mouth; and of theſe ſome black, with a cruſt of Brimſtone, ſome of a red hew; others finer, ſaid to be got out of the gutturs of fire at the very Mouth. Both theſe kinds are light; but then there is a third ſort of Stone, very ſolid and ponderous, which ſeems to be made up of a conflux of divers Minerals, melted together.

Thirdly, A piece of Sal Ammoniack, and ſeveral pieces of Sandever, beſides thoſe moiſt Vitriolate Aſhes abovementioned.

All which was accompanied with a *Mapp* of that part of the Country, where the Fire hath run; in which Mapp the annexed Scale of a *Mile* ſhews, that the Fire ſpred about 3. miles in breadth, and 17. miles in length; the ſame being now quite extinct, but that only in the clefts or hollownes's of the rocks of *Sciarri* ſome fire ſtill remains glowing.

Some Obſervations
Concerning the Organs of Generation, made by Dr. Edmund King, *a Fellow of the R. Society, and by Dr* Regnerus de Graeff, *Phyſitian in Holland; which later occaſioned the publiſhing of the former.*

The Obſervations of the former *we ſhall here declare, as he preſented them in writing to the R. Soc. the 17th of* December *1668, which was as follows;*

You may remember, that about 3. weeks ſince I brought the *Teſticulos Cuniculorum marium* diſſected in ſeveral ſhapes; which appear'd to ſeveral of this illuſtrious Company, as well as to my ſelf, to be indeed made up of Veſſels; and I then had particularly ſhow'd them to M. *Hook* and ſome others, and the manner how they lay; who ſeem'd to be fully ſatisfied by the help of a good Glaſs, they then made uſe of. And being deſired, to give in the Account in writing, I cannot but affirm here, that I find the Veſſels in the *Teſtes* of this kind of Animals to lye in round folds, in the manner of the little inteſtins, but both ends of each roll meeting at their inſertion, which ſeems to be made into the *Ductus Nervoſus*: And every one of theſe little rolls are very curiouſly embroidered with other veſſels, which I Judge to be Veins and Arteries by reaſon of their reddiſh colour; appearing in them even to the bare Eye.

Theſe little rolls ly in ranges, having a kind of vniformity not unpleaſant to behold by a good light. But I do not mean, that every one of theſe rolls is one entire tube, but conſiſts of many tubes, beſides the ſaid Embroidery of Veines and Arteries: For, when I cut one of the ſaid rolls tranſverſe, there ſeem'd to me (and ſo, I ſuppoſe, will it do to any, that think it worth examining,) 5. 6. or more diſtinct tubes in one roll, contain'd as 'twere, in one common *membranula*; but the fine texture and tenderneſs of them is ſuch, that they will not admit of expanſion in ſuch a manner, as ſome other *Teſtes* will, and eſpecially as that of a *Ratt* is ſaid to doe by Dr *de*

Graeff (if we miſtake him not;) yet if it ſhall appeare; that they are really made up of veſſels, though of never ſo many ſorts, I humbly conceive you will not think the Experiment loſt, becauſe I ſuppoſe the chief thing intended by theſe trials to be, that it may be well known, what indeed the Body of the *Teſtes* is made of; Whether indeed it be a *Congeries* of Veſſels and Liquors without any intermediate ſubſtance, as was aſſerted by me to many of this Honorable Company, ſeveral years agoe, concerning moſt if not all parenchymous parts, which was inſerted in Numb. 18 of the *Ph. Tranſactions*, ſince which time I have made ſeveral Experiments of the ſame kind, about the *Teſtes*, the *Pancreas*, and other ſo eſteem'd *Glands*; and as far as I have examined them, I find them to be only a Texture of fine Tubes or ducts, with more or leſs liquor, without any other ſubſtance.

But perceiving, the *Teſtes* of *ſeveral* Animals to be *variouſly* compoſed and intertext; I proceeded *ad Teſticulos Tauri*, which I have diſſected and ordered ſeveral wayes; ſome boyled, others broiled, others infuſed in Spirit of wine, hot and cold; *&c.* and upon the beſt examination, I can make, I cannot ſee any of this intermediate ſubſtance, or indeed any thing elſe, that is not Veſſel or Liquor.

Now in obedience to your comands, I have added another Experiment, and that is *Teſticuli humani*, (the exact knowledge of whoſe fabrick we ſuppoſe to be chiefly aimed at in this kind of Inquiry,) hoping to prove it clearly, and perhaps to put it out of diſpute, That it is nothing elſe but a *Congeries* of Veſſels of various ſorts, and their ſeveral Liquors; and that there is no ſuch thing as an intermediate ſubſtance (by what name ſoever it be call'd;) And to demonſtrate this, I think, it will evidently appeare to the bare Eye, by what I have here expanded, * which is the true genuine ſubſtance *Teſticuli humani*, I mean, the Body of it, after the *Tunica albuginea* is remov'd, without any addition or diminution, excepting only what Liquors are dryed up during the time of the Expanſion, which colud not be prevented in making ſuch a Scheme of it,

* *See Fig. 1. which repreſents only the* 4*th or* 5*th part of what was exhibited of the ſame* teſtis *after the ſame manner with this on Glaſs.*

as this is.] And this is continued from one end to the other of the Glaſs, on which you ſee it exhibited, in ſeveral places, without breaking; which breaking yet does not at all prejudice the truth of this Experiment. And although I had not time to open every part, which you ſee to be like that ſubſtance, I deny; yet I can order it ſo, as to ſhow you with eaſe, that that alſo is nothing but Congeries of Veſſels, as aforeſaid, not yet opened; fix on what part you pleaſe.

And if it ſhould be objected, that this may be drawn out into *ſeeming* Veſſels, which yet may not be *really* ſuch; I anſwer, that theſe Veſſels have the ſame appearance in the Body of the *Teſtis*, as to denote them ſuch, before they are drawn out; and in the extenſion it does ſometimes ſo happen, that one of them will extend eaſily near halfe a yard long, before it breaks, though ſo exceeding delicate and tender, as you may imagine: And when it is thus extended, it hath a kind of reſemblance of the corrugations of the *Epididymis*, and keeps the ſame figure and magnitude in the whole extent of them, as to the ſight, unleſs they begin to dry, and then you may ſee them looſe their *girations* upon ſtretching: as you may ſee of both ſorts on the Glaſs above mentioned.

And if the greateſt part of theſe Veſſels are Arteries, or other Veſſels, that immediately receive liquors from them; I may prove, I think, from another Experiment, made by Injection into a part of the *Arteria præparans*, before I began to expand the Body of the *Teſtis*; whereupon opening the part, which I ſaw diſcoloured, I found, that many of theſe Tubes had received ſome of the fine particles of that matter, which I tinged my injected Spirit with.

And to prevent another Objection, that might ariſe, *viz.* That theſe particles might poſſibly change their colour only outwardly; I uſed other endeavours to aſſure my ſelf, that the ſaid particles were indeed included within the Cavities of theſe tubes. In the doing of which, I did moiſten thoſe two Tubes with Spirit of wine, to ſee whether that would remove or alter thoſe particles; but finding no ſuch thing, I prickt and open'd with a fine needle part of the containing tube; whereupon I ſaw iſſue forth ſeveral of thoſe liquid particles afore-mentioned: Which aſſures me farther that this is a meer Scheme or Congeries of veſſels.

I have made ſeveral other Experiments of this kind, about other parts of the Body; not to mention the Muſcles, Heart, and Kidneys, becauſe I ſuppoſe, that few men will now undertake for a *parenchyma* in them. And as I have opportunity, I ſhall ſhew, I hope, that all ſorts of *Glands* (ſo called) are nothing elſe but Veſſels (and their Liquors) variouſly wrought, and receptacles of ſeveral Liquors for divers uſes; the difference of which alters their Colour, Conſiſtence *&c.* My meaning is, that there is in no reputed *Gland* any other thing, than in the Body of the Teſtis, *viz.* That it hath not this or that intermediate ſubſtance, but that the Liquors, regularly come and goe to and through them in fine tubes (in ſuch and ſuch heaps and figures, as may make them appeare ſo and ſo form'd in ſeveral parts of the Body, where they are ſcituated;) As alſo, that the more conſpicuous Veſſels of the Body have other veſſels, that help to make up their Coats, and ſerve for the nouriſhment of the ſame, beſides ſuch, as import or export thoſe liquors, for the conveyance of which they were deſigned for common uſe. But of this hereafter, as occaſion ſhall ſerve.

So farr Dr King: As to Dr. *de Graeff*, we ſhall deliver what he lattly imparted to us upon this ſubject, in his own words, extracted out of his Letter dated *July* 25. 1669. at *Delft*: accompanied *cum Teſticulo Gliris diſſoluto, & tranſmiſſo in Spiritu vini*; repreſented in *Fig.* II.

Quod Clar. D. Clarck *ait, Se parenchyma (quod ſuccum quendom denotare dicit affuſum vel effuſum & aliquomodo concretum in vaſculorum & fibrillarum interſtitiis,) in Teſticulis virorum & aliorum etiam animalium, teſtimonio ſenſuum oſtendere poſſe; hoc Ego, pace tanti viri dixero, nonniſi Autopſiâ edoctus admittere poſſum. Quandoquidem ſæpiſſimè Hominum aliorumque Animalium teſticulos, exceptis tenuiſſimis quibuſdam membranulis, ita diſſolverim, ut ne umbra quidem talis parenchymatis remaneret; imò, quod magis eſt, quorundam Animalium teſticulos ita diſſolvi, ut viſus acie ne quidem membranulæ illa conſpicerentur. Et ut verba mea factis comprobem, mitto ad Te* Gliris *teſticulum meo modo diſſolutum, ut videas, an Glandulæ tales in Teſtibus (qua-*

les proponit Clar. Dn. Clark in Epiſt. ſua, 18. Maji. 1668. Tranſactionibus Philoſophicis inſerta) vel etiam Parenchyma tale, quale in Epiſt. ſua 10. Maji, 1669. deſcribit, reperiatur. In hunc ferè modum reliquorum Animalium Teſticulos diſſolvere poſſum, eâ tamen diverſitate, ut in nonnullorum Teſtibus aliquæ membranulæ tenuisſimæ, & in quorundam, radix præterea Epididymidis Highmori remaneat.

So farr theſe two induſtrious Phyſitians; which though it looks very fair to evince, that the *Teſtes* of Animals are made up of nothing but Veſſels and their liquors, yet doth our Learned and Inquiſitive Dr. *Timothy Clarck*, and divers other Ingenious and expert Anatomiſts and Phyſitians ſtill doubt, whe-[illegible] : cannot be [illegible] os'd Veſſels [illegible] (which in ſo fine and tender a part may well be thought to ſerve for a *parenchyma*,) but alſo that Monſieur *de Graeff* muſt himſelf grant, that in the ſaid part there are found certain ſmal Membrans beſides thoſe Veſſels, he is aſſerting; ſuch another ſubſtance being conceived to be highly neceſſary to ſerve for a *medium*, whereby that compounded liquor, which from the greater Veſſel paſſeth into the minute arteries, nerves and lympheducts of the *teſtes*, may be ſecreted, and according to the different nature and figure of their ſeveral particles conveyed into thoſe ſeveral ſmall and ſubtil veſſels.

An Extract of a Letter

Written by the Learned Dr. William Durſton, *Phyſitian at* Plimouth, *to the Right Honorable the Lord Vice-Count* Brouncker *as Preſident of the R. Society; concerning a very ſudden and exceſive Swelling of a Womans Breaſts.*

My Lord

In obedience to the commands of the Right Honorable the Lord Ambaſſadour for *Barbary*, I preſent your Lordſhip with a *Phæmonenon* and matter of fact in Nature, which, for its rarity and prodigiouſneſs, may, with a leſſer check to me from your Lordſhip for the preſumption, and a leſſer regret for the avocation, obtain the favour of your peruſal. The thing is evident, and ſhews itſelf, and can w ſhall be atteſted by thouſands, but above all the reſt by his Excellency, the ſaid Lord Ambaſſadour, who was an Eye-witneſs of it, and impoſed this task on me, of giving your Lordſhip a perfect Narrative of the wonder, which is as follows;

Elizabeth Trevers, 23. or 24. years of age, fair of complexion, brown-hair'd, of an healthy conſtitution, low of ſtature, of honeſt repute, but of mean and poor parentage, near this Town, was on Friday July 3d. 1669. in good health, and went well to bed, where ſhe took as good reſt and ſleep, as ever before, but in the morning, when ſhe awaken'd, and attempted to turn herſelf in her bed, was not able, finding her Breaſts ſo ſwell'd, that ſhe was affrighted to an aſtoniſhment. Then endeavoring to ſit up, the weight of her Breaſts faſtned her to her bed; where ſhe hath layn ever ſince, yet whithout all pain and weakneſs either in her Breaſts, or in any other part.

This being nois'd abroad, ſeveral Phyſitians and Chyrurgions reſorted to her: ſome propoſed cutting off her Breaſts, which I was wholly againſt, adviſing for the preſent only an emollient and temperately warme *fotus*., and once gave her a *Bolus* with * * * * * *; upon the taking of which ſhe had ten motions *deorſum*, and the ſwelling ſomewhat abated; but the Maid was ſo weaken'd upon it for 2. or 3. days after, that I durſt not attempt any thing of that nature ſince; *ſed quia paſſa fuit ſuppreſſionem menſium per ſex retrò menſes, Diuretica non nulla*, & *ſanguinis menſtrui prolectamenta præſcripſi*, intending alſo Phlebotomy. The *Tubuli* or pipes of the Breaſts are all very hard and ſwelled; and indeed the whole breaſts ſeem to be nothing elſe but thoſe *tubuli*, and little or nothing of wind or water. As near as we can gueſs, the left breaſt weighs about 35. pounds, but the right ſomewhat leſs. And the skin of the Back, Neck and Belly ſeem to be drawn towards the Breaſts to ſerve for the diſtenſion. The meaſures of the Breaſts are theſe;

See Fig. III.	Feet.	Inch
The Circumference of the right Breaſt	2.	7
Of the left Breaſt	3.	1 $\frac{1}{2}$
The length of the right Breaſt from the Coller-bone	1.	5 $\frac{1}{2}$
The length of the left Breſt	1.	7 $\frac{1}{2}$
The breadth of the right Breaſt as it lyes	1.	1
The breadth of the left	1.	4 $\frac{1}{2}$

Thus farr, My lord, the matter of fact, faithfully related.

Now what ſhould occaſion thoſe monſtrous tumors of the whole Breaſts, and that ſo ſuddenly in one night, keeps us in great ſuſpence. There occurs nothing in this point ſatiſfactory in the writings of *Platerus*, *Rhodericus à Caſtro*, *Fontanus*, *Foreſtus*, or any other of the Moderns, that I have ſeen, writing *de Morbis Mulierum*, ſuitable to what may be offer'd upon the *Data* of the Circulation of the Blood, the Lymphæducts, and the *Vaſa Chylifera Thoracica*, and probably ſome Capillary veſſels branching thence (in their progreſs to the *Sub-clavials*) through the Intercoſtal Muſcles into the Breaſts. I humbly beg pardon for this tediousneſs *&c.*

Plymouth, July 1°, *1669.*

This Narrative having been produced and read at the R. Society, *and the Author of it thanked for his communication, and deſired to impart what he ſhould further obſerve in this very odd Accident, he was pleaſed to write, ſome while after, a ſecond Letter to the Publiſher, as follows;*

Sir.

I Had written to you ere this, but that I unhappily miſlaid your Letter among other papers; but having, after much ſearch, found it again, I return the Moſt Honorable Society and you my very humble thanks for your invitation of me to continue my Obſervations about the vnuſuall ſwelling of the Breaſts, heretofore deſcribed.

About the beginning of this month, our prodigious woman in Coughing brought up at ſeveral times ſome blood; but this I ſoon took off; and at that time there appeared ſeveral cutaneous ulcers upon her Breaſts and other parts, *& abundè in verendis* (ut à fæminis edocebar) which laſt I cured; but thoſe on her breaſts in part remain, and daily diſcharge, by the ſole ap-

plication

plication of Cole-leaves , good quantity of ſanious matter. And the Patient complaining alſo at that time of grievous interjuncture pains , eſpecially vpon the *Tibiæ*, I ſuſpected *&c.* and applyed *Empl. de Ran,* * * * and gave her 3. ſucceeding mornings * * * for a doſe. The third day , it wrought *ſurſum & deorſum* pretty briskly ; after which her pains vaniſh't and many of thoſe *vlcuſcula* ; and her breaſts (which, ſince her Caſe, formerly ſent up, were grown conſiderably bigger and very painful) much leſs'ned , and her pains alſo ; and ſhe, though drooping much before , and out of hopes of life , exceedingly revived. This indicated to me , what I was further to do for her. I gave her on ſunday laſt * * * ; which wrought upward plentifully ; and ſhe daily gets ſtrength ſince , and her Breaſts abate. I deſigne to ſalivate her, in hopes to correct that vitious ferment , which is ſpued out of the *Genus nervoſum* into the Breaſts , and contributes much to thoſe tumors. But I ſhall now ſtop my hand , *&c.*

Plymouth Septemb. 17. *1669.*

Some Reflexions

Made on the enlarged Accompt of Dr Witties *Anſwer to* Hydrologia Chymica *in Numb* 51. *of theſe Tracts ; chiefly concerning the Cauſe of the ſudden loſs of the vertues of Mineral waters.*

Theſe Notes were made by the Learned Dr Daniel Foot, *in a friendly Letter of his (dated October 11th. 1669.) to the Publiſher , as follows.*

Sir

YOur laſt publiſht *Tranſactions* N° 51. have adminiſtred the occaſion , and the Candour , I know you poſſeſs , hath encouraged me to give you this trouble. In your enlarged accompt of D. *Witties* Anſwer to *Hydrol. Chymica*, p. 1039. l. 21. you ſay ; *This I had not here mentioned but to introduce our Authors weighty remark ; That theſe waters looſe all their virtue , yea their quant and bulk alſo , though in Glaſſes and under the Hermetick ſeal, if removed from the fountain-head* &c. Now, Sir, 'tis a truth , if not univerſally , yet generally known and aſſented to by unlearned as well as learned , that ſome ſort of Medicinal waters looſe their virtue, if remov'd to any conſiderable diſtance from their fountain-head; but others do not, at leaſt not ſo ſoon. To this laſt ſort belong ſuch, as are our *Barnet*, *Epſham* and *Dullidge* waters; to the other ſort belong our *Tunbridg*, *Aſtrap* and * *Stall-bridge*-waters; and all ſuch like here or elſe where: And the common uſage of the Sick, taken from the adviſe of their Phyſitians, and the Experience of all, in repairing to thoſe reſpective places, ſufficiently proves the common conſent thereunto.

But though the effect be ſo plain and manifeſt, yet the cauſe thereof ſeems not to me ſo plainly diſcovered; and becauſe you are pleaſed to your fore-cited words to ſubjoyne theſe; *And even their quantity and bulk alſo, though in Claſſes and vnder the Herm. Seal &c*: I ſuppoſe, you intimate and offer, that the cauſe of the loſs of their Medicinal vertues is upon the loſs of their quantity and bulk: which alſo you aptly ſtrengthen by the authority of the famous Doctors, *French*, ab *Heer*, and *Frambeſarius*; and then in a parentheſis you put altogether, and cautiouſly ſay (*doubtleſs thorough the loſs of the Volatile Spirits*) &c. And in the beginning of the very next paragraph you goe on thus; *Whatever theſe Spirits be, that will neither endure to travel from the Place, nor will be confined in any bottle, nor under any ſeal* &c. So that the ſum of your *Conjecture* (for as other you propoſe it not) is, That this loſſe conſiſts in the Avolation of ſome moſt ſubtle and penetrating Spirituous parts, not to be impriſoned by any incloſure imaginable, but will find their way out, and leave the waters bereft of virtue, and decreaſed in quantiy too, and (what more is) perhaps of their weight alſo, eſpecially if they looſe of their quantity. But to this laſt you modeſtly add, *Here we want inſtruction, whether that decreaſe was as well of weight, as of bulk* &c.

That this Conjecture of yours concerning the Cauſe of the loſs of virtues in theſe waters carried from their Spring, may be true, I do not abſolutely deny, but further acknowledge, that it is the ſentiment of very many, if not all, Phyſitians and Naturaliſts, that have concern'd themſelves with the conſideration thereof; and I my ſelf have entertained the very ſame thoughts of it, and doe not now but ſuppoſitively relinquiſh them. But having lately, in reading *Tachenius*'s *Hippocr. Chymicus* (newly recommended by your ſelf in N°. 50. of your *Tranſact.*) found c. 16. ſomewhat relating to this matter; I began by the encouragement of his authority to reſume ſome Conjectures touching the ſame, which I had, if not abandoned, yet kept ſuppreſt in ſilence, which indeed are of another kind, but how true I yet know not. Wherefore I thought, it might not be very un-accepable to you, if I deſired you, publickely to give notice of theſe Conjectures, that the Learned may reaſon and find out the truth of them; whence may reſult no few nor very unuſeful diſcovery's for the increas of knowledge, the benefit of mankind, and the glory of the Creator of all. In order thereunto I deſire, you will propoſe theſe or ſuch like Queries;

---

* *This was in* Numb. 51 *by a miſtake placed in* Somerſet, *whereas it lyes in* Dorſet-ſhire.

1. Whether by Chymical reſearches it wes ever yet or can be found, that ſuch waters as the above-ſaid, ever yielded either a Vinous or an Acid, or any other ſort of Spirits, that were either inflammable, or un-inflammable, or flying over the Helm from the fire.

2. Whether all theſe ſorts of Waters, when they are moſt cloſely ſtopt up, and ſo let ſtand, or conveyed to ſome diſtance, doe not let fall a ſediment (moſt commonly) yellowiſh, or of ſome ſuch colour, when they are become effæte in their veſſels.

3. Whether, when they are let ſtand only, and not moved by carriage, they do not ſooner become caſtrated, and ſooner precipitate an *Ochre* to the bottom?

4. Whether ſuch an *Ochre* is not found in all their Spring-heads, and Streams alſo; but more in the Head than in the Streams, eſpecially if iſſued there-from to a good diſtance.

5. Whether it may not be found upon due Obſervation, that two Bottles of the ſaid waters, whereof the one being induſtriouſly ſtopped, the other left unſtopt, and both equally permitted to ſtand ſtill or equally moved, will not equally looſe their virtues Medicall in the ſame ſpace of time, and have the ſame precipitated ſediment, and be of the ſame taſte, colour, and alike diminiſht in quantity, with divers others ſuch like circumſtances?

6. Whether two Veſſels, diverſified in their matter, and conſequently in their parts, pores and figures of the whole (as e. g. a Glaſs-bottle and an Oxe-bladder, or any two ſuch like) fill'd with ſuch waters, will not yeild the like *Phænomena* in all circumſtances, as in the 5th *Query* are mentioned?

7. Whether it may be deviſed, how to prevent all precipitation of a ſediment in the Waters veſſeled up; and then to obſerve thereupon, whither their vertues would not be kept entire during ſuch a prevention?

8. Whether any Obſerver ever found the Waters enervated but found withall an Ochre, let fall to the bottom or ſides of the containing veſſel?

9. To be brief, Whether the *Phænomenon* of loſs of vertues in ſuch Waters may by an *Hypotheſis* of an inteſtine Precipitation of their parts, wherein thoſe vertues conſiſted, be as well (if not better) explicated, than by the *Hypotheſis* of an Avolation of Spirituous parts through all Veſſels and cloſures whatſoever?

Which Hypotheſis that it may be the better weighed, I ſhall only exhibit it, and leave it to the Ingenious and Learned to conclude concerning it.

Firſt therefore it is generally received amongſt moſt, eſpecially the more polite, Chymical Authors and Students, That, if any Medical vertues be in Minerals or Metals, it conſiſts in their Sulphurs; which are of a Volatile and Alcaliſate property; eſpecially when not intimately commix't with, or after commixtion perfectly freed from their Mercurial parts.

Next, its as much received, even to become a Cymical Maxime, That Acids and Alcaly's mutually operate upon one another to a ſatiety, to an abating, and (if circumſtances correſpond) to an utter amiſſion of their former activities, and laſtly to a production of a *Tertium neutrum*.

Again they alike conclude, that Salts act beſt in a State of Solution. All which Premiſes thus concenter in this Hypotheſis;

That the Waters, which *materially* make ſome Springs, paſſing under ground by the veine of ſome Mettal, which yet is *in fieri*, having firſt taken up of an Acide Salt which is in the Earth, thereby catcheth hold on the immature Sulphur of that

Metal;

Mettal; and preſently glides it along with it ſelf to the Springs orifice, and from the moment of the *Sulphur* and Acide *Salt's* meeting and contact begins a mutual action and reaction upon one another which never ceaſeth, till both are imperceptibly ſpent, and blended into a new Body, which then the water lets fall, and we call an Earth, Ochre, or *Sediment*: After the production of which Ochre, the Medicinal vertues of the immature *Sulphur* is lockt up into the inſeparable embraces of the Acide *Salt*, and ſo is loſt, or at leaſt diſappears. But this mutual action and reaction may laſt, till the Waters iſſue out of the Earth, and for ſome ſmall time longer, and ſo long their Medical vertues are to be imparted, and no longer.

This, *Sir*, is the Hypotheſis of *Tachenius* (if I rightly apprehend him) which I ſend, not to have it Juſtle out the more received one, or any other that may be propoſed; but that it may have its Tryall, and accordingly may live or dye. I could alledge more in its behalf, eſpecially in the particular of ſuch a Body, as we commonly call an *Ochre*; reſulting from divers Experiments of Vitriol: but I have treſpaſſed too much already to hope for pardon from any, but *&c.*

An Accompt of two Books

I. *GUAGING EPITOMISED, by MICHAEL DARY. London, Printed by* W. Godbid 1669. *upon one* folio *page.*

A Table of *Squares* and Cubes is of general uſe, but more particularly in *Guaging*, for taking away *Proportional* work in computing the Contents of Brewers Tuns from inch to inch, or by as great portions as you pleaſe; or for making the Tables of Gallon-meaſure for Mr. *Oughtreds* Guage-Rod: Yea each kind of Table doth much expedite the *Guaging* of *Caske*, as may be ſeen in this Printed Sheet of Mr. *Dary*, wherein he ſuppoſeth, that a Beer or Ale-Gallon contains (according to the late Eſtabliſhment by Law) 282. Cubical inches; a Wine-Gallon, according to cuſtom and Experiment, ~~231.~~ Cubical Inches: And he takes an Example (of a *Canary* Pipe) whoſe diameter at the $\left\{\begin{array}{c}\text{Bung}\\ \text{Head}\end{array}\right\}$ is $\left\{\begin{array}{c}32\\ 22\end{array}\right\}$ inches, and Length 44 inches.

And if you ſuppoſe the Heads of ſuch a Cask to be two Plains erect to the Axis, and alike remote from the Center, cutting off both ends of the figure produced, then, if the middle *fruſtum*, ſo intercepted, be computed as

						The Content in Wine Gallons is about
The	Solid Zone	of	a	Sphæroid		$126\frac{1}{4}$
				Parabolical		$115\frac{1}{2}$
				Spindle.		
			two	Cones.	Of the ſame	$110\frac{1}{3}$
				Parabolical	baſe and	$112\frac{8}{15}$
	Trunci			Conoids	height	

the Method of Calculation being very eaſy by either ſort of Tables, and of great affinity in all theſe figures. And whereas the Learned have commonly ſuppoſed, Cask to be the midle *fruſta* of *Spheroids*; and given Rules accordingly for Gaaging them, thoſe ſuppoſitions, as Vintners and others upon experience aſſert, are found too much to enlarge the Capacity, ſo that a *Canary* Pipe, that is reputed to hold about 126. gallons, upon Experiment hath been found to contain but 116. gallons: And to determine, what figure is moſt proper to be admitted, ought to be built upon ſuch an Experiment as this;

Conceive a Caske to lye upon an Horizontal Plain with its *Axis* paralel thereto; and Perpendiculars on the outſide of the ſmooth boards of the Cask to fall, from the Head, Boung, and ſome intermediate point between, upon the Plain or Floore; and in like manner the axis to be deſigned: Then find out ſuch a curved line of ſome property, that may paſs thorough the ſaid Points, which conceive to have a rotation about the Axis-line: the round ſolid ſo made may be taken to repreſent the Cask; and in the Writings of *Geometers* divers Curves are to be found, that are capable of paſſing through ſuch Points and their round *Solids* meaſured. But if the Reader think this too nice and troubleſome, and that the *Sphæroid* way is too great, and the *Parabolick* ſpindle too little, then the Author gives ſcope enough between; ſhowing how to contrive ſuch Rules, as ſhall beſt agree with Experience.

II. HISTOIRE NATURELLE DES ANIMAUX PLANTES ET MINERAUX, *qui entrent dans la Compoſition de la* THERIAQUE D'ANDROMACHUS; *par M. Charas In* 12. *A* Paris.

AS there are above 60 ſorts of different druggs, which are ingredients of this no leſs difficult than famous and uſefull Medicine, which was invented by *Andromachus*, Phyſitian to *Nero*; and as thoſe drugs are ſubject to be ſophiſticated, and require different preparations, ſo there are few men, that are ſufficiently skill'd to chuſe aright all thoſe ingredients, or dextrous and patient enough to prepare them well. The Author of this Book treats of this celebrated medicament, and not only teacheth the way of compoſing it, but interſperſeth many not inconſiderable remarkes touching the nature and vertues of all the Druggs, which compoſe it.

He is of opinion, that commonly there are committed many faults in preparing the Ingredients, of which the Theriack is made up. E. g. When the Vipers are prepared, the cuſtom is to whip them; thereby to make all the venom go to the head, which is cut off when they are ſufficiently enraged. They alſo boile the fleſh, thereby to draw forth what venemouſneſs may yet reſt therein, and their bones are caſt away as uſeleſs. Whereas he ſaith, that it being by Experience evident, that all the venom of the Viper is in his Teeth and Jaws, that whipping is not only to no purpoſe, but alſo dangerous, in regard that the Spirits being chafed and irritated may beget venom in the body, wher was none. He aſſerts alſo, that the water, in which the viper-fleſh is boyled, carryes away all the vertue; and that the bones that are thrown away are no leſs uſeful, than the fleſh itſelf.

He takes further notice, that *Opium* hath not thoſe ill qualities, which many aſcribe to it, who teach, that it ſuffocateth the natural heat, and that there need no more than 3. graines to diſpatch the luſtieſt man: whereas he aſſures, that himſelf hath taken 6 graines of it without having been more ſtupifyed by it, than he uſed to be; and that inſtead of being debilitated, he hath found himſelf ſtrengthned by it. He adds, that he knows a man of a conſtitution delicate enough, who hath taken of it to 30. grains, and yet not found any troubleſome accident upon it; on the contrary that the Patient hath found himſelf ſo well after it, that he continued to take the ſame doſe twice or thrice a week.

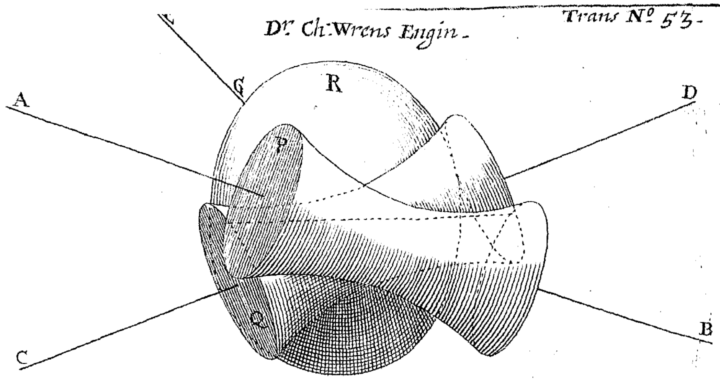
He obſerves alſo, that whereas it hath been diſputed, what might cauſe the difference of Colour in the White and Black *Pepper*, ſome believing, that Pepper gathered before it was ripe, looked white, but became black in ripening; others pretending, that as the ſame Vine-ſtocks, which produce white grapes, do not bear black ones, ſo they are different plants, that bear Pepper of different colour; our Author affirms, that this diverſity of Colours proceeds thence, that the black Pepper is covered by its skin, which the white is bared of &c.

ERRATA *in* Numb. 51.

PAg. 1028. l. 7, *r*, by a bank of. *ibid*. l. 9. *r*. preſerve this bank. *p* 1039. l. 33. *r*. botles well ſealed up.

Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, and are to be
ſold at the *Bell* a little without *Temple-Bar*, 1669.

Trans No 53.



Dr. Ch: Wrens Engin.

For ye Salt-work.

Fig. I.

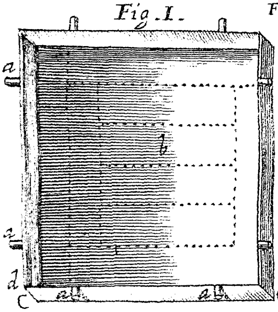


Fig. III.

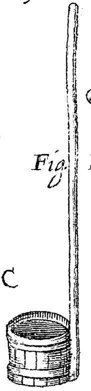


Fig. IV.

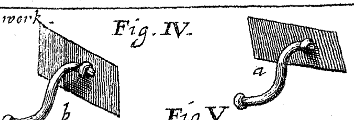


Fig. V.

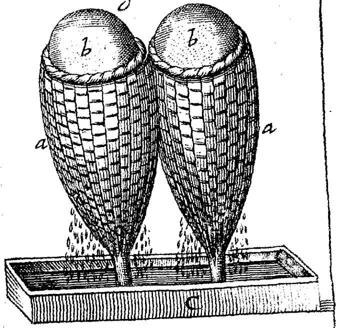


Fig. II.

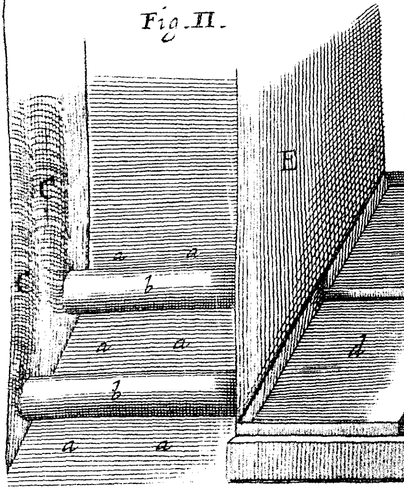
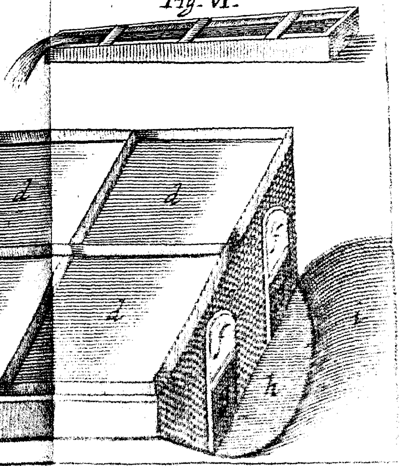


Fig. VI.



Numb. 53.

PHILOSOPHICAL TRANSACTIONS.

November 15. 1669.

The Contents.

A Deſcription of Dr. Chriſtopher Wren's *Engin, deſigned for Grinding* Hyperbolical *Glaſſes. Some Inquiries concerning the Salt-ſprings at* Nantwich, *anſwered. An Extract of a Letter, concerning the Death of the Bigg-breaſted Woman, diſcourſed of in Numb.* 52. *An accompt of ſome Books:* I. *CERTAIN PHILOSOPHICAL ESSAYES, and other TRACTS by the Honorable ROBERT BOYLE: The Second edition, enlarged.* London; *printed for H. Herringman in the New-Exchange; A.* 1669. II. *DEL MOVIMENTO DELLA COMETA, apparſa A.* 1664*: Da PIETRO MARIA MUTOLI, in* Piſa, *in* 4°. III. *ERASMI BARTHOLINI de COMETIS A.* 1664. *& A.* 1665. *Opuſculum.* Hafniæ *in* 4°. IV. *SYLVA & POMONA, reprinted with Enlargements, by I. EUELYN. Eſquire &c.*

A Deſcription

of Dr. Chriſtopher Wren's *Engin, deſigned for grinding Hyperbolical Glaſſes; as it was in a manner promiſed* Numb. 48. *p.* 961.

We ſhall give it in the Author's owne words, as followeth.

S*Int tria Corpora terendo idonea, P. Q. R; quorum P. & Q. ſint æqualia & Columnari forma, R vero Corpus Lenti-forme. P. rotetur circa axin A B; Q, circa* C D; *& R, circa* E G.

Sint autem A B & C D in diverſis Planis, ita tamen ut E G producta, ſit ad rectos *angulos vtrique A B & C D: accedant denique ad ſe invicem Corpora, prout opus fuerit, ſervata tamen eadem inclinatione & ſitu Axium.*

Dico, ex revolutione & mutua attritione Corporum prius poſitorum exurgere noua corpora Geometrica, quorum P & Q erunt Cylindroidea Hyperbolica *æqualia, R. vero* Conoides Hyperbolicum, *ſpecie & magnitudine datum.*

Demonſtrationem in promptu habemus, nec non Modulum ipſius Machinæ, terendis Lentibus Hyperbolicis deſtinatæ; quam operoſa pictura & prolixa explicatione deſcribere, mihi & artifici magis fuerit moleſtum, quam Dædalo *cuivis ſagaci ſimilem ad-invenire. Poſtquam enim expoſita jam ſunt principia Geometrica, facile erit conjicere, quale ſit Inſtrumentum; nempe, tres ſunt Tabulæ oblongæ, planæ, validæ, labiles, & ſibi invicem impoſitæ: Infima & Media ſuſtinent* inæqualia *Capitula (ſive Anſas mamphur ſuſtinentes) alternatim poſita; id poſtulat utriuſque mamphuris obliquitas & quaſi decuſſatio: Summæ Tabulæ* æqualia *ſunt Capitula in longum Tabulæ diſpoſita; & perforato citimo Capitulo mamphur tranſmittitur. Omitto rotas, rotulas, lora, pondera, cochleas, & reliqua ad motum expeditum & Machinæ firmitudinem neceſſaria. P pertinet ad infimam Tabulam; Q ad mediam; R, ad ſummam. R, Lens eſt vitrea: Q, Modulus Lentem terens; P, Formula Modulum corrigens; quæ, dum motu obliquo, & diverſo a motu tam Lentis quam Moduli, fertur, delet continuo & deterit, quicquid vitii imprimitur in Modulum ex Lentis & Materiæ attritione.*

Quare, cum adeo ſimplex & ſpontanea ſit iſta Hyperbolici Conoidis *genitura, ex ſolis nempe motibus Circularibus; cumque motus ſit duplex & varius, credibile eſt, Lentes* Hyperbolicas *ex hiſce Principiis vel nullis fore explicandas.*

Some Inquiries Concerning the Salt-Springs *and the Way of* Salt-making *at Nantwich in Cheſhire; Anſwer'd by the Learned and Obſerving* William Jackſon *Dr. of Phyſick.*

1. W*Hat is the depth of the Salt-ſprings?* The depths are various, in ſome places not above 3. or 4. yards. In our Town of *Nantwich*, the Pitt is full 7. yards from

the footing about the Pitt; which is gueſsed to be the natural height of the Ground, though the Bank be 6. foot higher, accidentally raiſed by rubbiſh of long making Salt, or *Walling*, as they call it, In other places the Springs lye much ſhallower; for in two places within our Townſhip the Springs break up ſo in the Meadows, as to frett away not only the graſs, but part of the earth, which lyes like a breach, at leaſt halfe a foot or more lower than the turfe of the Meadow, and hath a Salt liquor, ouſing, as it were, out of the mudd, but very gently.

2. *What kind of Country 'tis thereabout, where the Springs are, whither Hilly &c.; And what Plants grow near them?* Our Country is generally a low ground, witneſs the name given to it (*the Vale Royal of England*;) yet 'tis very full of Collicular Eminencies, and various Riſings, to diſtinguiſh it from being all Meadow. We have alſo a peculiar ſort of ground in this County and ſome adjacent parts, which we call *Moſſes*; and they are a kind of Mooriſh boggy ground, very ſtringy, and fatt: which ſerveth us very well for Turfs, cutt out like great Bricks and dried in the Sun. And this kind of ground is ſo much here, that there are few Townſhips but they have their particular Moſſes. In theſe is found much of that Wood we call *Firr-wood*, which ſerves the Country-people for Candles, Fewel, and ſometimes for ſmall Timber-vſes; and this the Vulgar concludes to have layn there ſince the Flood. But generally theſe Moſſes ſeem to be places undermined by ſome Subterraneous ſtreams; or by the diſſolution of ſome matter, that made them equal with the reſt of the ground formerly: In which conjecture I am confirmed by this, That near a place of My Lord *Cholmondeley's*, called *Bilkely*, about 9. or 10. years ſince, not far from one of theſe Moſſes, without any Earth-quake, fell in, a piece of ground about 30. yards over, with an huge noiſe, and great Oakes growing on it fell with it together; which hang firſt with part of their heads out, afterwards ſuddenly ſunck down into the grounds, ſo as to become inviſible: Out of which Pitt they drew Brine with a pitcher tyed to a cart-rope, but could then find no bottom with the ropes they had there: Since, the Pitt is filled up with water, and now doth not taſte Salt, but a very little brackiſh, a very ſmall rindlet paſſing through it. The

neareſt Salt-ſprings to this place are at *Dirtwich* about 3. miles from it, belonging to the preſent Lord *Keeper*, and My Lord *Cholmondeley*.

Some *Hills* we have, but no bigg ones, near our Springs; which generally lye all along the River *Weever*, as *Hankillow*, *Hatherton*, *Oſterſon*, *Bartherton*, *Nantwich*, *Weever*, *Leftwich*, *Northwich*; yet there is an appearance of the ſame Veine at *Midlewich* nearer the River *Dane*, than *Weever*; which notwithſtanding ſeems not to be out of the Line of the *Weveriſh* ſtreame; and theſe lye all near Brooks, and in Medowiſh grounds.

As to *Plants*, I could obſerve no ſingularity at all; for, where the Salt reaches the ſurface, it frets away all (as I ſaid before,) and upon the Turfe near the old decayed Pitts grows the very ſame, that doth in the remoteſt place of the Meadow; only I obſerve, that, where the Turff was fretted away, *Ruſhes* maintain'd their ſtation longeſt; yet they grow alſo in other moiſt grounds, ſo that they are no friends to the Salt-ſprings, but I perceive, they reſiſt them beſt.

3. *Whether there be any Hot-ſprings near the Salt-ones? And Whether the Water of the Salt-ſprings be hotter or cooler, than other Spring-water?* The Water of the Salt-ſprings here is very cold at the bottom of the Pitt, inſomuch that when the Briners ſometimes goe about to cleanſe the Pitt, they cannot abide in, above half an hour, and in that time they drink much Strong water.

There is not any Hot Springs (that I can hear of) nearer us, than *Buckſton*-well, which is about 30. miles diſtant near *Darby-Peak* Hills.

4. *Whether they find any Shells about thoſe Springs, and what kind of Earth it is?* I cannot hear of any Shells digged up, though of late ſeveral new Brine-ſprings have been both ſought, and found by ſinking deep Pitts; yet none knows of any Shels, but rather a blackiſh Slutch mixt with the Sand, which infects the whole Spring (like the Scuttle-fiſh) black, when 'tis ſtirr'd; elſe the water runs very clear.

5. *How ſtrong the Water is of Salt?* Springs are rich or poore in a double ſence; for a Spring may be rich in Salt, but poor in the

quantity of Brine it affords. Thus they have a rich Brine in their chief Pit at *Midle-wich*, which yields a full *fourth* part of Salt, like the rich *Burgundian* Springs, mentioned in *Kircher's Mundus Subterraneus*; yet this is ſo thrifty of its brine, that the Inhabitants are limited to their proportions out of it, and their quantity is ſupply'd out of Pitts that afford a weaker Brine. Our Pitt at *Nantwich* yields but a *ſixth* part; but then 'tis ſo plentiful a Spring, that, whereas they ſeldome *Wall*, that is, make Salt, in above *6*. Houſes at a time, and there are or ſhould be about 50. Wich-houſes in the Town; this Pitt is Judged ſufficient to ſupply them all: And this advantage would accrew over and above, that ſuch quick Uſe of the Pitt extreamly ſtrengthens the Brine, perhaps to a degree little leſs than that of *Middle-wich* Pitt: For, I have tryed it myſelf, that a quart of Brine, when the Pitt hath been drawn off *3*. or *4*. days firſt, to ſupply 5. or *6*. Wich-houſes, hath yielded an Ounce and an halfe more of Salt, than at another time, when it hath had a reſt of a week or thereabout. But I conclude, that the neareſt conjecture, to be made of the ſtrength of this Brine, is, to yield *one* pound of Salt for *ſix* pounds of Brine; as I have ſeverall times tryed without any operation that might obſcure the working: By which proportion you ſee, that *ſix* Tuns of Brine yield *one* tun of Salt: which may be built upon; though in their ordinary way of working they make ſuch variety of Additions, that 'tis impoſſible for any to be confident of the Product.

To adde ſome particulars, concerning this point; I ſhall tell you, that *March* 8. 1668. I weighed *two* pounds of diſtilled water in a narrow-mouthed Glaſs-bottle, that I might make an exact marke for a quart. This Bottle, being fill'd with our Brine to the very ſame mark, weigh'd (beſides the tare of the Bottle) *two* pounds *three* ounces and *five* drachmes. This was taken up, when the Wich-houſes but began to work, ſo that the Pitt was but little drawn. I fill'd up the Bottle with the ſame Brine, and it weighed juſt three drachms more. This Brine, boyled away without any addition or clarification, made *five* ounces and *two* drachmes of Salt. Five days after, when the Pitt had been drawn all that while for the working of the Wich-houſes, vid. *March*. 13, the ſame Bottle, fill'd to the Quart-mark aforeſaid with Brine *then* taken up, weighed, beſide the Bottle, *two* pounds *four* ounces and one ~~drachme~~ half: the ſame time the Bottle, filled as in the former Experiment, weighed juſt *two* pounds and an *halfe*, which is three drachms more than the quart mark before; which boyl'd into Salt made *ſix* ounces *ſix* drachms and *two* ſcruples: which exceeds the former quantity of Salt, *one* ounce *four* drachms and *two* ſcruples, though the Brine exceeded the former in weight but *four* drachms.

By which Tryall I confuted alſo a Tradition, which the Briners have amongſt them, *viz.* That the Brine is ſtrongeſt at times of the Spring-Tydes, to wit, at the Full and Change of the Moon. For *March* 8th. aforeſaid was only one day paſt the Full, and then the Brine was weaker than it was the 13th day, when 'twas 6. days paſt the Full. So that I conclude, there could be no other reaſon, than that the much drawing makes way for the Salt-ſprings to come the quicker, and allows the leſs time for the admiſſion of Freſh Springs.

6. *What is the Manner of their Work? or What Time of boyling the Salt-water? Whether they uſe any peculiar thing to make it granulate, and if ſo, What that is?* Their manner of working is this: They have formerly boyl'd their Brine in 6. Leaden pans with wood-fire; upon which accompt they all claime their intereſt in the Pitt by the name of ſo many *Six Leads Walling*; by which they each know their proportion; but in the memory of many alive they changed their 6. Leads into 4 Iron-pans, ſomething better than a yard ſquare, and about 6. inches deep, ſtill fitting the Content of theſe to that of the 6. Leads: and of late many have changed the 4 Iron-pans into two greater; and ſome *Wall* but in one: But ſtill the Rulers gage it to their Old proportions. Thus much ſeem'd neceſſary for underſtanding the ſeveral Operations.

They uſe for their Fewell, Pit-coals, brought out of *Stafford-ſhire*. Theſe Panns are ſet upon Iron-barrs, and made in, on all ſides, very cloſe (that the flame nor ſmoak break through) with clay and bricks. They firſt fill their Pans with Brine out of the Pitt; which coms to them in ſeveral Woodden Gutters: then they put into their Panns amongſt their Brine a certain mixture, made of about 20. Gallons of Brine, and 2. quarts of Calves Cows and chiefly Sheeps bloud, mixt into a Clarret-Colour: Of this mixture they put about 2. quarts into a Pann that holds about 360. quarts of Brine; this bloudy brine, at the firſt boyling of the Pann, brings up a ſcumm, which they are careful to take off with a Skimmer, made with a woodden handle thruſt through a long ſquare of Wainſcot-board, twice as bigg as a good ſquare trencher: this they call a *Loot*. Here they continue their fire as quick as they can, till halfe the Brine be waſted, and this they call *Boyling upon the freſh*. But when'tis halfe boyled away, they fill their Panns again with new Brine out of the *Ship*, (ſo they call a great Ciſtern by their Panns ſides, into which their Brine runs through the Woodden Gutters from the Pump, that ſtands in the Pitt;) then they put into the Pann, 2. quarts of the Mixture following: They take a quart of Whites of Eggs, beat them throughly with as much Brine, till they are well broken; then mix them with 20. Gallons of brine, as before was done with the Bloud; and thus that which they call the *Whites* is made. As ſoon as this is in, they boyle ſharply, till the ſecond Scum ariſe; then they ſcum it off as before, and boyle very gently till it Corne; to procure which, when part of the Brine is waſted, they put into each Pann of the Content aforeſaid about a quarter of a pint of the beſt and ſtrongeſt Ale they can gett: this makes a momentany Ebullition, which is ſoon over, and then they abate their fires, yet not ſo but that they keep it boyling all over, though gently; for the Workmen ſay, that if they boyle faſt here, (which they call *Boyling on the Leach*, becauſe they uſually all this time lade in their Leach-brine, which is ſuch Brine, as runs from their ſalt, when'tis taken up before it hardens) if I ſay, they boyle faſt here, it waſts their Salt. After all their Leach-Brine is in, they boyle gently, till a kind of Scum come on it like a thin Jce; which is the firſt appearance of the Salt: then that ſinks, and the Brine every where gathers into Cornes at the bottom to it, which they gently rake together with their *Loots*: I ſay, *gently*; for much ſtirring breakes the Corne. So they continue, till there is but very little brine left in the Pann; then with their *Loots* they take it up the Brine dropping from it and throw it into their *Barrows*, which are Caſes made with flat cleft wickers, in the ſhape almoſt of a Sugar-loaf, the bottom upper-moſt. When the Barrow is full, they let it ſtand ſo for an hour and an halfe in the Trough;

where it drains out all the Leach-brine aboveſaid, then they remove it into their Hot-houſe behind their Works; made there by two Tunnels under their Panns, carried back for that purpoſe. The Leach-brine, that runs from the Barrows, they put into the next Boyling, for 'tis to their advantage, being ſalt melted, and wanting only hardning.

This work is perform'd in 2. hours in the ſmaller panns, which are ſhallower, and generally boyle their brine more away; wherefore their Salt will laſt better, though it does not granulate ſo well, becauſe, when the Brine is waſted, the fire and ſtirring breaks the Cornes. But this Salt weighs heavier, and melts not ſo ſoon; and therefore is bought by them, that carry it farr. But in the greater Panns, which are uſually deeper, they are above halfe an hour longer in boyling; but, becauſe they take their Salt out of their Brine, and only harden it in their Hot-houſe, 'tis apter to melt away in a moiſt Air: Yet of this ſort of Salt the bigger the grain is, the longer it endures; and generally this is the better granulated and the clearer, though the other be the whiter. Vpon which I rather think, 'tis the taking of the ſalt out of the Brine before it be waſted, that cauſes the granulating of it, than the Ale to which the Workmen impute it. This kind meaſures profitably well; therefore much bought by them that buy to ſell again.

They never cover their Panns at all, during the whole time of Boyling. They have their Houſes like Barns open up to the thatch with a Lower-hole or two, to vent the ſteam of the panns. Poſſibly Tiles may do better, but no body is yet ſo curious as to try, but the ſteam is ſuch, that I am confident, no plaiſter will ſtick, and boards will warp, and their nailes will ruſt ſo, as quickly to fret in pieces.

7. Whether the Salt, made of theſe Springs be more or leſs apt to diſſolve in the Air, then other Salt? And whether it be as good to powder Beef or other Fleſh with, as French Salt? This Queſtion I cannot well anſwer, in regard that *French* Salt coms not to us, to compare the efficacy of the one with the other experimentally; but this I can aſſure for our Salt, that with it both Beef and Bacon is very well preſerv'd ſweet and good a whole year together; and I do apprehend this Salt to be rather more ſearching than *French*

Sa't, becauſe I have often obſerved, that meat kept with this Salt ſhall be more fiery Salt to the midſt of it, than I have obſerved, when I have eaten powder'd meat on Ship-board, which was probably done with *French* Salt, I then being on the South-ſide of England, and in a Dutch Veſſel. 'Tis certain, *Cheſhire* ſends yearly much Bacon to *London*, which never yet had any mark of infamy ſet upon it; and hanged Beef (which others call *Martin*-maſs-Beef) is as good and as frequent in *Cheſhire*, as in any place; ſo that I conclude, that this Salt is fully effectual for any Uſe, and as good as any other; and therefore hope, 'twill be proſecuted in the uſe, that ſo the Trade of our own Commodities may rather be advanced, than of forraign, eſpecially this of Salt; which if it ſhall pleaſe the *R. Society* to promote, they will lay an obligation on all our Country never to be forgotten.

Mean time, if I have related here any thing obſcurely or imperfectly, I am ready to anſwer any new Queries, that ſhall ariſe out of this obſcurity, or give larger ſatisfaction to any of the Old, that ſhall be thought hereby not ſufficiently explained.

Explication of the Figures belonging to the Accompt of Salt-making.

Fig. 1.

This is the Model of an Iron-pann of that proportion, when Four *are uſed in one houſe.*

a a. *The Eares to hang the Pann by upon the Brick-work.*

b. *The ſeveral Junctures of the Iron plates riveted.*

C C. *The breadth and length of the Pann near 4. foot.*

C d. *The depth of the ſides of the Pann, about 6. inches.*

Fig. 2.

a a. *The Hot-houſe between the Wall and the Chimney.*

b b. *The two Tunnels.*

CC. *The Chimney-back, into which the two Tunnels conveigh the ſmoake.*

d d d. d. *The four Panns.*

E. *The partition-wall between the Panns and the Hot-houſe.*

f. *The Fire-places.*

g g. *The Aſh-holes.*

h. *The Hearth below.*

i i. *The deſcent to the Hearth.*

ou Fig. 3

. . . . *ale, with which they reach brine out of their Ship to fill their Panns withall.* p.109

Fig. 4.

a. b. *Several poſitions of their* Loots, *with which they skim, and gather their Salt.*

Fig. 5.

a.a. *Two* Barrows *newly filled with Salt; ſet into the Leach-trough to dripp out the Leach or Leack-brine,*

b b, *The Salt heaped above the Barrows and patted down hard.*

C. *The Leach-trough.*

Fig. 6.

A gutter, which they lay over from one Pann to another, to poure the Brine into the fartheſt panns.

An Extract of a Letter Written to the Publiſher from Plymouth Novem. 2. 1669. *by* William Durſton *Dr. of Phyſick; concerning the Death of the Bigg-breaſted Woman (diſcourſed of in* Numb. 52.*) together with what was thereupon obſerved in her Body.*

Sir,

I Thank you for yours, which by reaſon of my abſence came not to my hands till this day. *Elizabeth Travers* dyed on Thurſday night, *October* 21. The next morning I ſent for a Chirurgion, and ſome others to be preſent at the opening, and taking off of her Breaſts; though we only took off one, *viz.* the biggeſt, which was the left, and having weighed it, we found it of *Sixty four* pounds weight. Upon the opening of it, (which we made in ſeveral places) we could find neither Water, nor Cancerous humors, nor any thing vitious, more than the prodigious bigneſs; and the *Tubuli* and Parenchymous fleſh were purely white and ſolid, and no other than what we ſee in the ſoundeſt Breaſts of Women, or the beſt Udders of other Animals. She had loſt her ſtomach and reſt ſeverall weeks before, and made great complaints of her Breaſts from their great diſtenſion; and her whole Body was exceedingly emaciated. I have ſent you incloſed *one* meaſure, which was the *Breadth* of her two Breaſts (as ſhe was layd out on a Table being dead;) I mean, from the further end of the one to the other; which you'l find *three foot two Inches* and *an halfe*; and *another* meaſure, ſhewing the *Circumference* of the Breaſts *long*-wiſe, *viz. four foot*, and near *four* inches; and a *third*, giving the *Circumference* of the *Breadth*, *viz. three foot four inches* and *an halfe*.

The right Breaſt we took not off, but we gueſs, it weighed *fourty* pounds. I did ſome weeks ſince begin a Salivation with her, which leſſen'd her Breaſts in circumference ſome inches; but ſhe proving not conformable, I durſt not proceed to keep up the flux, but was forc'd to deſiſt. But ſhe was wonderfully revived afterwards for ſome time. She being weary of that courſe, I then cauſed a *Cauſtic* to be applyed; upon which the *Eſchar* falling off, yet nothing iſſued out of the Breaſt.

Then I cauſed an Inciſion-knife to be uſed, and made an Inciſion two inches and an halfe deep (ſuppoſing the Cauſtick had not wrought deep enough) but 'twas to no more purpoſe, than the former.

An Accompt of ſome Books.

I. *CERTAIN PHILOSOPHICAL ESSAYES, and other TRACTS, by the Honorable ROBERT BOYLE, Fellow of the R. Society. The Second Edition, enlarged.* London; *printed for* Henry Herringman *in the New Exchange. A. 1669.*

WE could not but give the Curious Reader notice of this reprinted and in divers places conſiderably enriched Book; but chiefly increaſed by the Addition of a very Philoſophical Diſcourſe about the *Abſolute Reſt in Bodies*, wherein the Noble Author, with his uſual modeſty as well as acuteneſs, delivers his Thoughts concerning the Inteſtin Motions of the Particles of *Quieſcent Solids*, and in doing ſo calls the *Abſolute Reſt* of Bodies in Queſtion, by undertaking to prove, That ſome of thoſe Bodies, which we think have their parts *moſt* at Reſt, are not exempted from having internal Motions in them; to which proof he Judgeth 'twill be conſequent, that it muſt be probable, that in other Bodies, whoſe Solidity is confeſſed inferiour, the component Particles are not in a State of *Perfect* Reſt.

II. *DEL MOVIMENTO DELLA COMETA, apparſa il meſe di Dicembre 1664. da PIETRO MARIA MUTOLI, in* Piſa, *in* 4°.

THis, and the next following Tract, (conſiſting each of a few ſheets only) ſhould ſooner have been taken notice of in theſe *Tranſactions*, if they had ſooner come to our hands. The Subject being Curious and weighty, it was thought fit to advertiſe the Inquiſitive Reader, though ſomewhat late, of what is diſcourſed upon it by other Learned men, beſides thoſe whom we have formerly noted.

This *Author* then doth principally diſcourſe of the Motion and Place of that Comet, and how its odd Appearances may be ſalved; and in regard that in ſuch a Diſcourſe of the Motion of a Body, ſeen in the Heavens, 'tis requiſite to ſuppoſe the Form and Conſtitution of the Celeſtial Bodies, and in what manner they make their Revolutions, He thought it requiſite, either to chooſe ſome or other of the moſt famous Hypotheſes concerning them, or elſe to endeavor to ſolve the *Phænomena* of this Comet, according to all thoſe Syſtems: Of which two Tasks he hath choſen the latter; in the proſecution whereof he ſeems ſatisfied, that the Comet of *1664*. was above the *Moon*, it having been found without a ſenſible *Parallax*; for the obſerving of which, he ſhews an eaſie way, which needs no Quadrants or Sextants curiouſly made; nor a preciſe taking of the Meridian Altitudes; nor the Scituation of the Comet in the Zodiack; nor the noting of the preciſe time of the Obſervation; nor *laſtly*, needs to fear to be prejudiced by the Conſideration of the various Refractions; foraſmuch as he works not by the way of taking the ſeveral Altitudes from the Horizon, but by obſerving the Poſition of the Comet among ſome neighbouring Fixt Starrs: for the doing of which, he ſaith, he employed only a ſimple Thread ſtretch't out by an Arch, to make it evident, whether this Comet had a ſenſible *Parallax*, or no.

III. ERASMI BARTHOLINI *de* COMETIS *An.* 1664 & 1665. *Opuſculum; Ex Obſervationibus Haſniæ habitis adornatum.* Haſniæ *in* 4°.

This is the other Tract, we hinted in the next precedent Accompt; and in it the Author, having firſt intimated, That the more narrowly this Subject about *Comets* hath been ſearch't into, the farther have Intelligent and Perſpicacious men receded from the opinion of the *Peripateticks* concerning them; he acquaints the Reader, what Inſtruments he uſed in making Obſervations, among which was a Quadrant of 1½ foot *radius*; what conveniency he had as to the place of Obſervation; what Obſervations he made, *viz. A.* 1664. *Decemb.* 23. 24. 25. 26. 27. 28. 29. 30. 31. and *A.* 1665. *Januar.* 1. 3. 4. 5. 6. 7. 9. 12. 24. 31. and *Februar.* 7. Further, how he found the Longitude and Latitude of this Comet by obſerving its diſtances from two Fixt Starrs; and having found thoſe, how thence he found its right Aſcenſions and its Declinations for every day: Beſides, How he found the Motion of the Comet in his Orb, and the Place of Interſection and the Angle of Inclination with the Ecliptick. To which he adds his Conſiderations about the Place of the Comet, and the *Parallaxes*; vindicating here the Noble *Tycho* from the Accuſation of *Ricciolo* in *Almag. Novo:* Concluding all with an Inveſtigation of the *Cauſes* of Comets; where he examins, Whether Comets be co-eval with the World, or produced anew, and if the latter, How: Inſinuating withall, that, though he eſteems the latter Comet to be different from the former, yet, admitting the *Carteſian Hypotheſis*, we may without any difficulty maintain, that it was the ſame with the firſt.

IV. *SYLVA & POMONA, by* JOHN EVELYN *Eſq. Fellow of the R. SOCIETY.* Reprinted by *John Martin* and *James Alleſtry in fol. London.*

This is the *Second* Edition of this Book, very much improv'd and enlarged. It was the firſt that was written and publiſhed by the expreſs Order of the *R. Society*, who thought it fit to begin with a ſpecial Sollicitation for the good Culture of our own Native Country, that it might be a leading Example to all our Neighbours, and as far as their Inſtructions are received.

In *Sylva* our Author provides and directs for ſound *Timber*, and ſtore of the beſt *Fuell* in Forreſts, Woods, and Groves. *Timber* is the ſtrength and walls of this Kingdom; and is ſerviceable for many Domeſtick uſes, and curious Utenſils; and to advance the Richeſs and Accommodations, not only of our own Country, but alſo of all Forrain parts, as far as may mutually oblige each other by Navigation and Commerce.

And together with his *Majeſties* great Example, *Pomona* hath already encourag'd the Plantation of many hundreds of Nurſeries, or Orchards in *England*, which by this time begin to reward the induſtrious Owners with a ſalubrious Liquor, perhaps more agreeable to our Engliſh Temperament, than the Grapes of ſome Countries do afford; and, if well choſen, more gentle, and more pleaſing to the palat, than many ſorts of French Wines without Sugar; and yet requiring much leſs labour, leſs artifice, and fewer hands for the yearly culture.

This Worthy perſon hath alſo given us (under a modeſt veil) an Inſtructive Touch for *Vineyards in England* (of which ſee *Numb.* 15. *p* 262.) And for the behoof of his own Country hath condeſcended to furniſh us with accurate Tranſlations of the *French Gardiner*; and of the beſt Writers of *Architecture*, and of the *Idea of the perfection of Painting* (of which laſt ſee *Numb.* 39. *p.* 784.)

Of his own Collections, he hath given us an elegant Hiſtory of *Sculpture*, and of Engraving in Copper, and the curious Arts thereunto belonging: In which the moſt excellent Painters of this Age may ſee themſelves either duly celebrated, or directed for the beſt, and aſſiſted, or at leaſt encourag'd.

And (beſides other Treatiſes, which are *Anonymous*, as being of a reſerv'd nature, but are neverthleſs entirely for the honor of the King and this Kingdom, and generally for the good of all Men;) He hath lately made two conſiderable Excurſions: In *one* of which Tracts, for a Caution to all future Ages, and to denote the general aptneſs of Mankind to be deluded and deceived, he hath publiſht a well-grounded Hiſtory of the *Three late famous Impoſtures*; the *firſt*, meerly Caſual and innocent, in *Padre Ottomanno*; the *ſecond*, bold and impudent, in *Mahomet Bei*; the *third*, a confident Cheat, in *Sabatai Sevi*, the Jews Counterfeit Meſſias: In the *other* Tract, *Publick Employment and an Active Life* are *preferr'd to Solitude*.

Thus He, and other Generous perſons, can in the crowd of public buſineſs, find, or make leiſure to oblige all men; whilſt *Moroſe Schoolmen*, and *Narrow Criticks*, make it their main buſineſs to outgoe Satan in their falſe Accuſations, diſingenuous Surmiſes, and immodeſt Diſturbances of the nobleſt endeavors and atchievments.

But thrice happy were all *England*, if every where, with united minds and affections we were as heartily inclin'd, and as active to cultivate this our kind Soil for an *Elyſium*, as this Liberal Author is now buſie and preparing for the Preſs another more Auguſt and Noble Work, bearing the Title of *Englands Elyſium*. This was the Method of the Great Creator: He planted the *firſt Paradiſe* for an Entertainment of Innocent Man; and introduced the firſt Lectures of *Experimental Philoſophy* upon Animals and Vegetables. And again, when Gods peculiar People after the Conqueſt of their Enemies, were firſt eſtabliſht in peace and proſperity, their *Philoſophical* Monarch was inſpired with the ſublimeſt Wiſdom, not only for the Building of a Glorious Temple in the Holy City, but alſo for the Culture of the Land of Promiſe with the Plantations of Gardens and Orchards; and for the Experimental knowledg of all Vegetables. And thus alſo, as modern Princes may laudably follow the greateſt Examples of all foregoing ages, his *Majeſtie* immediately after his Reſtauration, made it his firſt work to Recover the Church to its Primitiue Faith and Order: Thence he proceeded, *to* promote the ſeveral Branches of the Antient Wiſdom; the knowledge both of *Nature*, by the proper Teſt of Gods own Works; and of all Excellent *Arts*, Medical, Chymical, Mathematical, and Mechanical; Architecture Naval, Civil and Military, for the ſtrengthening of his Royal Navy, the repairing of his Palaces, and the rebuilding of our Chief City incomparably fairer and ſafer than ever it was : *To* ſend out his Fleets, for a ſpecial countenance of Trade, and at the ſame time for a ſatisfaction to many conſiderable Philoſophical Inquiries in moſt parts of the World : *To* ſtrengthen his remoteſt Dominions; and *to* ſecure and cultivate his American Colonies, for the Silk-trade, and the growth of ſuch beneficial Vegetables, as thoſe ſeveral Soils in ſeveral diſtant Climats will bear; Not intermitting thoſe elegant Ingenuities of beautifying his Coyn with the faireſt and really Gardian-ſtamps; and of ſtoring his Cabinets with the Curioſities and Rarities of Art and Nature, for the encouragement of Sculpture, Picture, and of no ſmall number of Artificial Practices and uſefull Inventions. To be ſhort, his Majeſty ſoon gave to all the Kingdom, in *St. James's Park*, and *Hide Park*, in the Approches to his faireſt Palaces, and in his Forreſts, Illuſtrious Patterns for the beſt Improvements, and for a copious Variety of all kinds of Amænities. Now when our idle Multitudes ſhall be ~~ſtrongly~~ throughly inured to thoſe innocent and profitable Employments, till all our *Hills*, which are now bald, ſhall be ſhelter'd with the Cheſnut, the Beech, the Pine, Box, Maple, and the Royal Oak; and all our *Valleys* adorn'd with the fruitful Knots of *Cyrus*, and like the golden Gardens of *Alcinous*; then ſhall we have fair grounds to hope for the bleſſings of Peace and Plenty, and the Juncture of ſound and uſefull Philoſophy with Chriſtian Charity; and of true Religion and Piety with cheerful Loyalty; and then we ſhall truly deſerve the Old Style of the *Fortunate Iſlands*, and the *Gardens of Heſperides*.

ERRATA in Numb. 52.

Page 1048. l. 32. r. 35. pounds. p. 1055. l. 34. r. 231. for 281.

Printed by T. N. for *John Martin*, Printer to the
Royal Society, and are to be ſold at the Bell
a little within *Temple-Bar*. 1669.

[Numb. 54.

PHILOSOPHICAL TRANSACTIONS.

December 13. *1669.*

The Contents.

The Extracts of Two Letters, one written from Paris *concerning ſome Tranſactions there, relating to the* Transfuſion of Blood; *the other, from* Plimouth, *giving an Accompt of the hindrance of opening the Big-breaſted Woman after her death. An Appendix to the former Diſcourſe of the* Salt-Work. *A Relation, touching the Quick-ſilver-Mines in* Friuli, *confirming and enlarging the Accompt formerly given of the ſame. A Narrative of an odd Lake in* Carniola. *An Accompt of ſome Books: I. MECHANICA, ſive de MOTU Tractatus Geometricus, A.* Joh. Wallis *SS. Th. D.* &c. II. *NATH. HIGHMORI de Hyſterica & Hypochondriaca Paſsione Reſponſio Epiſtolaris ad Doct.* Willis. III. *NOUVELLES EXPERIENCES ſur la VIPERE, par M. CHARAS.* IV. *ATHANASII KIRCHERI ARS COMBINATORIA.* V. *THEODORI KERCKRINGII M. D. Spicilegium Anatomicum, nec non* Oſteogenia *Fœtuum.*

A Letter

Written by an Intelligent and Worthy Engliſh Man from Paris, *to a Conſiderable Member of the* R. Society *in* London, *concerning ſome Tranſactions there, relating to the Experiment of the Transfuſion of Blood.*

SIR,

YOu have ſuch a Relation to the *Royal Society*, that I think my ſelf obliged to impart unto you the Honourable mention, I heard of that Noble Inſtitution in the *Grand Chambre* of the Parlement here, on Thurſday laſt, that Society being then publickly inſtanc'd in for the *Source of Noble Experiments*, and having the Precedency of thoſe in *Germany*, *Italy*, and other places of *Europe*; in that order, wherein the Orator thought fit to rank them.

The Occaſion of mentioning it was, That one Monſieur *Denys*, a Phyſitian, had been queſtion'd before the *Lieutenant Criminel* here for the Death of his Patient (a Man that had been ſtark Mad for ſeveral years) who had expired under his hands, while he was Transfuſing Blood into him, according to the New Experiment. The Operation had been twice perform'd with good ſucceſs; the Patient having had thereupon a good interval of two Moneths after the firſt, and all hopes of a longer after the ſecond, had it not been for the debauches in Wine and Brandy, that he fell to, ſoon after the Operation. He was a *Brittan* by birth, and the Original of his Madneſs, Love. That which Mr. *Denys*, ~~his~~ Advocate, very much gloried in, was, that (beſides that the Experiment had been practiſed with good, at leaſt with no ill, ſucceſs, in *England Germany*, *Italy*, *Holland*, &c. and defended in *Theſes* in almoſt all the Univerſities of *France*) there were two perſons, a Man and a Woman, preſent in the Audience, that received a benefit to Admiration from the Experiment, after they had been abandon'd by all Phyſitians and other helps.

In Juſtifying the Introduction and Uſe of New Experiments he ſaid, That the *Moſt precious Life to this State* (viz. That of his *Moſt Chriſtian Majeſty*) had been ſaved by the Adminiſtration of a lately invented *Emetique*.

This Advocat was the Son of Monſieur *le Premier Preſident de la Moignon*. The ſame was, not long ſince, in our Court, and is, I perceive, well known to it, and infinitely ſatisfied with the Civilities he had received from ſeveral perſons there. Though this was his firſt Action, yet his performance was a Maſter-piece, and he had an Audience ſutable; all Friends, I ſuppoſe, to his Family: among them were the Duke of *Enguyen*, the Dukes of *Luynes*, *Mortemar*, *Chaulne*, and a World of other Great Perſons, Men and Women.

The Pleading for the Widow Plaintiff will be on Thurſday next; but any odds would be laid on the Defendants ſide; though ſome partial Men here are more than ſuſpected to ſet on the Widow. Pardon, Sir, this Interruption, and believe me,

Yours, &c.

Paris, Nov. 30. 1669.

An Extract of a Letter

Written by Dr. Durſton *from Plymouth* Novemb. 28. 1669. *giving an Account, why the late Big-breaſted Woman was not open'd after her Death.*

SIR, IT was deſign'd to have examin'd the *Viſcera* of *Eliz. Travers*, but her Aunt, who was with her and took care of her, fell into ſuch a paſſion upon the propoſal of opening her, that ſhe ſeem'd to be for the time beſides her ſelf; and I could not by any art get her out of the Chamber, where the Corps was laid out, till ſhe ſaw her nail'd up in her Coffin. I never ſaw ſuch fondneſs ſhewn to a dead Body; and I was ſufficiently troubled to be thus diſappointed by a fond extravagant Woman: But yet I believe, if I had examin'd the Entralls, I ſhould have ſeen little or nothing extraordinary. For, to the laſt, I could perceive no ill ſmell from her Breath, or ſtreightneſs upon the Cheſt, or painfulneſs in her Breathing; and the *Egeſta per urinam*, &c. were well enough. If any thing worth Obſervation do further occurr in theſe parts, I ſhall upon every opportunity communicate it to you, who am, *&c.*

An Appendix

To the Diſcourſe concerning the Salt-work, publiſht in Numb. 53. *communicated by the ſame Doctor* Jackſon, *in a Letter of* Novemb. 20. 1669.

Qu. 1. *WHether thoſe Salt-ſprings do yield leſs water and more of the Salt, in great Droughts, than in wet ſeaſons?* *Ans.* Our Springs do not ſenſibly alter in their decreaſe or increaſe in either dry or wet ſeaſons; for, being plentiful Springs, we have alwayes the Pitt full: Only this is obſerv'd by the *Briners*, that they make more Salt with the ſame quantity of Brine

p. 1022

in dry, than in wet ſeaſons; and more Salt of the ſame quantity of Brine at the Full of the Moon, than at any other time.

2. *How long before the Spring, or in the Spring, it may be, before the Fountains break out into their fulleſt ſources?* *An.* 'Tis not obſervable at all in our Salt-ſprings, that the Brine riſeth more plentifully in the Spring-time, than at any other ſeaſon of the year: neither is there any ſenſible difference in the quickneſs of the ſources as to the times of the day.

3. *How much Water the Spring yields daily, or in an hour, ordinarily, or in great Droughts?* *An.* Our Pitt is about 5 yards ſquare or better, and of ſo plentiful a ſource, that I believe, it cannot be gueſſed; and the rather, becauſe it ſeems not to run much, when 'tis permitted to come at its full guage, where a vent through the bank into the River is; but being drawn much, ſo as to ſink it below its uſual guage, it ſo plentifully lets in, that 'twill ſerve all the houſes in the Town to work, without falling much lower than a yard or two at moſt: ſo that I believe, that, when 'tis full, its own weight ballances much the influx of the Springs, which are much quicker in a low Pitt, than a full one.

4. *At what diſtance, the two richeſt Springs,* of *Nantwich and Droytwich are from the Sea?* *An.* That of *Nantwich* is from the Sea about 30 Miles, *Droyt-wich*, being in *Worceſterſhire*, is not known to me.

5. *How near the foot of an Hill is to thoſe Springs; and what height the next Hill is of?* *An.* The neareſt Hill (of thoſe, that are worth calling Hills) to our Springs is about 7 Miles diſtant from them: the Hill ſteeper, but not much higher, than High-Gate Hill.

6. *Wherein conſiſt the Diſtinctions of thoſe ſorts of Salt, which are called Catts of Salt, and Loaves of Salt?* *An.* As *White* Salt is that, deliver'd in my former diſcourſe, and *Gray* Salt the ſweepings of ſuch Salt, as is conſtantly ſhed and ſcatter'd about on the floore without taking much of the Dirt, which occaſions its grayneſs (which ſells not at half the rate of the *White* Salt, and is only bought up by the poorer ſort of People, and ſerves them in ſalting Bacon, courſe Cheeſe, *&c.*) So *Catts* of Salt are only made of the worſt of Salt, when yet wettiſh from the Panns,

molded and intermixt with interſpers'd Cummin-Seed and Aſhes, and ſo baked into an hard lump in the mouths of their Ovens. The uſe of theſe is only for *Pigeon*-houſes: But *Loaves* of Salt are the fineſt of all for Trencher-uſe. No difference in the boyling of theſe from the common way of the fine Salt; but in the making up ſome care is uſed: for firſt they cut their Barrows, they intend for Salt-loaves, with a long ſlit from top to bottom equally on both ſides; then they tye both ſides together with cords; then fill this Barrow with Salt boiled as uſually, but in the filling are careful to ramm down the Salt with the end of ſome wooden bar, continuing this, till the Barrow be fill'd to their minds; then place it ſpeedily in their Hot-houſe, and there let it ſtand all the time of their *Walling*: wherefore they prepare for theſe Loaves at the beginning of their Work, that they may have all the benefit of their Hot-houſes; and when theſe begin to ſlack, they take out the Loaves, and untye the cords, that faſtned the Barrow, that both ſides of the ſame may eaſily open without breaking the Loaf. Then they take the Loaf, and bake it in an Oven where houſhold-bread hath been baked, but new drawn forth. This they do twice or thrice, till they ſee it baked firm enough; and this being plac'd in a Stove or in a Chimny-corner, and cloſe cover'd with an Hoſe of Cloth or Leather, like the Sugar-Loaf-papers, will keep very white, and when they have occaſion to uſe any, they ſhave it off with a knife (as you do Loaf-Sugar) to fill the Salt-ſeller.

I muſt not omit telling you, that all the ground, where Salt or Brine is ſpilt, is, when dugg up, excellent *Muck* for Grazing Ground; and even the Bricks, that are throughly tinged with it, are very good Muck, and will diſſolve with other Muck, and fertilize Land conſiderably (eſpecially Grazing ground) for at leaſt four years; but of this I ſhall perhaps take occaſion to ſay more in my Anſwers to your *Queries* of *Agriculture*.

A Relation
Concerning the Quick-ſilver *Mines in* Friuli; *communicated by* Dr. Edward Brown; *confirming as well the Accompt formerly given of that ſubject, in* Numb. 2. *of theſe* Tranſacti*ous, as enlarging the ſame with ſome Additions.*

THe Town of *Idria*, in the County of *Goritia* and Province of *Friuli*, is ſeated low, and encompaſs'd with Hills on all ſides. A River of the ſame name runs by it, which although *Leandro* terms it *ſuperbiſſimo fiume d' Idria*, yet I found ſmall and ſhallow at the time when I was there; though upon plentiful Raine it proves ſufficient to convey down the Firr-Trees and other Wood required in the building of the Mines, and alſo for Fuel required in the ſervice of them: And to this end there is an handſome work of Piles made ſloaping athwart the River (after the ſame manner as I obſerv'd in *Newſol* in upper *Hungary* croſs the River *Gran*;) to ſtop the Trees, which are cut down, and caſt into the River above this place.

What is chiefly conſiderable in this Town, are the *Quickſilver*-Mines, very well known to the Neighbouring parts, and exceeding uſeful to many at greater diſtance.

The entrance into theſe Mines is not high, or upon an Hill, as in many other Mines; but in the Town it ſelf, whereby they are ſomewhat the more troubled with Water, againſt which they are provided with many excellent Engins and Devices, as at other deep Mines. The deepeſt part of the Mine from the entrance, is between 120 and 130 fathoms.

Of the Quick-ſilver of this Mine they make two ſorts: The one they call *Iungfraw*, that is, *Virgin*-Quickſilver; the other, *plain* Quickſilver. *Virgin*-Mercury they call that, which diſcovers it ſelf without the help of Fire; and is either plainly to be ſeen in the Ore, or falls down in little drops in the Mine, and ſometimes ſtreams out in good quantity; as about ſeven years agoe it ran out of the Earth at firſt in a ſtreame as ſmall as a thred, and afterwards as big as a pack-thred, but ceas'd in three or four dayes.

That alſo is accounted *Virgin*-Quickſilver, which, having no need to paſs the fire, is ſeparated by water firſt in a Sive, and afterwards in a long trough, having very ſmall holes at one end. So that there are in a manner two ſorts of *Virgin*-Mercury; the one, running out and diſcovering itſelf without labour; the other, requiring ſome way of Extraction and ſeparation, though not ſo high an one, as by Fire.

Plaine Quickſilver they name that, which is not at firſt perceived by the Eye, or falls from the Ore, but is forc'd out by Fire. And this they obtaine out of the Ore, or out of the Cinnaber of Mercury, which they digg out of this Mine. The Ore of this Mine is of a dark colour, mix'd with red. But the beſt is an hard ſtone; which they commit not preſently to the operation of the Fire. but powder it groſsly, and work it by the Sive; that ſo, if any *Virgin*-quickſilver be found in it, it may be ſeparated in this manner, and what doth not paſs the Sive, may be ſeparated by Fire in Iron-furnaces; Fifty of them in a Fire.

The Quickſilver ore of this Mine is the richeſt of all Ores, I have yet ſeen; for ordinarily it contains in it *halfe* Quickſilver, and in two parts of Ore one part of Quickſilver, and ſometimes in 3. parts of Ore, two parts of Quickſilver.

I went into the Mine by the Pitt of St. *Agatha*, and came up again by that of St *Barbara*, deſcending and aſcending by Ladders. I aſcended at one of 639. ſtaves or 89. fathoms. *Andreas Siſerus*, in *Kircher's Mund. Subterraneus*, makes ſuch a dreadful deſcription of this Mine, that it might diſcourage any from attempting the deſcent; which makes me doubt, Whether he had been in any other Mine, eſpecially where the deſcent is made by Ladders.

This Mine, I was inform'd, hath been wrought 200. years, about the ſame ſpace of time with *Newſol*-Mine, but coms much ſhort in time of the Silver-mine at *Schemnitz*; and much ſhorter yet of the notable *Lead-mines* in upper *Carinthia* Some hundreds of men are employed about this Mine of *Idria*; of which the chief Officers are the Prefect, the Controller, and the Judge.

I heard no complaint of the *Damps* of this Mine, as I have heard of divers others; Yet the workmen are ſufficiently miſchiev'd without them: for, though they be not ſuddenly ſuffocated, yet the Mercury getting into their Bodies, they are languiſhingly deſtroyed by it. Much leſs could I hear any news of either noxious or innocent Apparitions, *Virunculi* &c. ſuch as ſome write, and many talk of in other Mines.

In a Laboratory, where the Quickſilver is ſeparated by Fire, I ſaw an heap of 16000. Retorts of Iron; every one of which coſts a Crown at the beſt hand from the Iron-furnaces in *Carinthia.* There are 800. Retorts and as many Recipients employ'd together, in drawing over the Quickſilver in 16. Furnaces; 50. in each Furnace, 25. of a ſide, 12. above, and 13. below of each ſide.

June 12, when I was there, they carried out 40. *Saumes* of Quickſilver into forrain parts, each *Saume* containing 315. pound weight, to the value of 4000 ducats of Gold. Though the conveyance be not eaſy, yet ſome is ſent as farr as *Cremnitz* in *Hungary*, for the uſe of the Gold-mines; and very much carried away Southward. For, though the River by the Town be but ſmall, yet they are not very farr from the *Sontius* or *Lyſonzo*, a conſiderable River, which runs into the Gulf of *Trieſte* in the *Adriatick* Sea.

In the Caſtle I ſaw 3000 *Saumes* of Quickſilver together, in barrels; the Quickſilver being firſt made up in double leather: And in another houſe as much rich Ore, as can be diſtill'd in 2. years, except they have great plenty of rain to bring down the wood; but, the Hills being high about them, it ſnows at the tops of them oftner than it rains.

The Countrys, through which I paſs'd, are ſingularly well wooded, and well ſtor'd with fair Trees, wherein, beſide ſuch as grow with us in England, are ſtately *Firrs, Larches, Pines, Pinaſters, Picea's*, and that nobly criſped and well grain'd kind of *Acer*, whereof *Viols* and *Violins* are made: Whereof there is alſo plenty in the Country of *Saltzburg* and *Carniola*.

Travelling ſometimes in the night, we had continually about us a great number of large *Glow-worms*, which put into papers gave a dimm light like Candles in Lanthorns; and the Aire alſo full of *flaming Flyes*, affording ſome delight to us.

The way unto this place I found difficult; for, travelling from places on the borders of *Croatia* by *Lovitch*, I was faine to paſs over great mountains; and coming from it, I paſs'd over *Swartzenberg* or the Black mountain, from whence I deſcended 10. miles in a rocky Country, and farr more ſtony than the *Crau* or *Campus lapidoſus* in *Provence*; and ſo to *Aidoſchini* and *Goritia*, and leaving the *Sclavonian* behind, entred into the *Lingua Fullana*, and ſo on to this Noble and incomparably fortified City; where being yet uncertain, whether I ſhould go to *Venice*, I would not omit to preſent you this accompt, which I beſeech you to accept from *&c.*

Palma nova in *Friuli* June 15. *1669.*

An Accompt from the ſame Dr. Brown *Concerning an Vn-common Lake, called the* Zirchnitzer-See, *in* Carniola.

Having croſs'd the River *Dravus*, and paſs'd Mount *Luibel* in the *Carnick Alpes*, by that noble paſſage, cut through the Rocks, and vaulted like that of *Pauſilype* near *Naples*, I had a deſire to take a view of the *Lake* of *Zirchnitz*, ſo much ſpoken of, and written on by ſo few; and therefore I went unto *Crainburg* upon the River *Savus*, and ſo to *Labach*, the chief City of *Carniola*; from whence I continued my Journey in *Carniola* betwixt the Hills and a great Marſh, till I came to *Brounizza*, two leagues from whence and beyond the Hills is ſeated the ſaid Lake, receiving that name from *Zirchnitz*, a town of about 300. houſes.

This Lake is near two German Miles long, and one broad. On the South-ſide thereof lyes a great Forreſt, wherein are many Deer, and wild Boares, Wolves and Bears. On the North ſide the Country is flat; but the whole Valley is encompaſſed with Hills, at ſome diſtance from it.

This Lake is well fill'd with Water for the greateſt part of the Year; but in the Month of *June* it ſinketh under ground, not only by percolation or falling through the pores of the Earth, but retireth under ground, through many great holes at the bottom of it: And in the Month of *September* it returns by the ſame, and ſo in a very ſhort time fills up the Valley again.

As the time of the waters Deſcent is ſhort, eſpecially when

the

the Lake grows lower, and hath for a while ſhewed ſome abatement, ſo the Aſcent and return is ſpeedy; for at theſe holes it mounteth with ſuch violence, that it ſprings out of the ground to the height of a pike, and ſoon covers the tract of Earth again.

And this piece of ground in the time of the retirement and abſence of the Water is not unfruitful, but by a ſpeedy and plentiful production of Graſs yieldeth not only a preſent ſuſtenance for the beaſts of the field, but a good proviſion of hay for the cattle in the winter.

Nor have the Inhabitants thereabout only the benefit of the ground by theſe Commodities, but alſo the recreation and profit by Hunting. For at the time of the waters abſence, Hares, Deer, Boares and other Animals come into it out of the neighbouring Forreſt and Country, and are taken ſeveral wayes by them.

The Lake is not only thus fill'd with water, but every year well ſtored with Fiſh. The Prince of *Eckenberg* is Lord of it and of much Country thereabout: But upon reſtoring of the waters all have liberty to Fiſh; and the fiſhermen ſtanding up to the waſt at the holes before-mentioned, intercept the paſſage of the Fiſh, and take a very great number of them, which otherwiſe would be ſecure for ſome Months under the Earth, and not fail to return in *September*.

The Fiſh of this Lake have a cloſer habitation than thoſe of any other I know; for, they paſs ſome Months under the Earth, and a good part of the Winter under Ice. I could not learn, that there were any *Otters* in this Lake, (which otherwiſe muſt probably have taken the ſame Courſe with the fiſh;) nor that there were any remarkable extraneous ſubſtances, any Vegetables, or unknown Fiſhes brought up by the water, but thoſe which come up are of the ſame kind with thoſe which deſcended.

But beſide theſe holes at the bottom of the Lake (of which there are many,) there are alſo divers Caverns and deep places in the Country of *Carniola*, even where there is no water; after the like manner as we have in the *Peack-country*, and at *Elden-hole* in *England*.

Halfe an Engliſh mile nearer the Lake than the town of *Zirchnitz*, ſtands a village named *Seadorf*, and neigher to the Lake than this, another village called *Niderdorf*: between theſe two there are Corn-fields; yet ſometimes theſe lands are alſo drown'd; and 'tis conceived, that there are divers ſubterraneous Caverns under them: for it happens ſometimes at *Niderdorf*, that the ground ſinks in ſeveral places upon the ſudden retiring of the Lake; and the aforeſaid Prince of *Eckenberg* was once ſo curious, as to deſcend into one hole, through which he paſſed under an Hill, and came out on the other ſide; as I was informed by Monſieur *Andreas Wiſer* the preſent Judg of Zirchnitz, and alſo by *Johanes Wiſer*, who hath formerly held the ſame place.

The people who are acquainted with the Lake, wet and dry, know where they are, and have a particular knowledge of the eminencies, vallies and inequalities of it: for, the bottom of the Lake is not even, or near about the ſame depth, but ſometimes two foot, and then ſuddenly twenty yards deep. And becauſe the Fiſh haunt the deep places more than the ſhallows; they have given names to the 7. chiefeſt cavities or valleys in the Lake.

I took boat at *Niderdorf*, and went divers miles on the Lake, paſſing over the five firſt valleys. I went alſo to a noted Stone, commonly called the Fiſhers-ſtone, which hath ſomewhat of the uſe of the *Nileſcope-pillar* at *Grand Cairo*; for by a certain appearance of that, they conjecture how ſoon the Lake will retire. I alſo paſſed by a noted Hill, which, when the Lake is high, becomes a pleaſant iſland; and ſo I returned, *&c.*

Venice June 20, 1669.

An Accompt of ſome Books.

I. *MECHANICA, ſive de* MOTU *Tractatus Geometricus. Auth.* Joh. Wallis *SS. Th. D. & Geom. Profeſſ. Saviliano, &c.* Londini; *Impenſis* Moſis Pit, *in Vico vocato* Little Britain, 1670. *in Quarto.*

THis Excellent Mathematician, having compoſed a Learned Treatiſe concerning the Doctrine of *Motion*, and what thereon depends, managing it in a manner altogether *Geometrical*, was pleaſed, upon the importunity of his Friends, to permit the *Firſt Part* thereof to come abroad, whileſt the others are ſtill in the Printers hands; which is about One third part of what he did, near two years ſince, impart to the R. *Society*, and was by them deſired to make it publick. In this Firſt Part he delivers,

1. The *General Rules of Motion*, promiſing thereto, as becomes a ſtrict Reaſoner and good Geometrician, the *Definitions* belonging to that Subject; and then compriſing the *Rules* themſelves in Thirty Propoſitions: In which he takes occaſion, among many other weighty particulars, to intimate, That it is principally the buſineſs of a *Mechanician*, to excogitate and make practicable ſuch Engins, to be interpoſed between the *Strength* and the *Weight*, as may ſo moderate the *Celerity* of *Motion*, as to compenſate the *Greatneſs* of the *Weight*, by the *Slowneſs* of the *Motion*.

Motion, or the *want* of *ſtrength*, by the *length* of *time*.

2. Of the *Deſcent of Heavy Bodies*, *and the Declivity of Motion*, Thirty four Propoſitions. In which he doth not think fit to explicate the *Phyſical Cauſe* of *Gravity*, whether it proceed from an innate quality in the Heavy Body it ſelf; or an Univerſal Tendency of Circum-ambient Bodies to the Center, or a Magnetical Power in the Earth, or the like; but contents himſelf (his purpoſe requiring no more) to underſtand by the word *Gravity*, that ſenſible force of moving downwards, or to a certain Point, both the Heavy Body it ſelf, and the leſs powerful Impediments: Shewing in this Part alſo, in what proportion the different Declivities of Oblique or Sloping Plains, in which a Heavy Body is ſuppoſed to be moved, doth operate to the Helping or Hindering of ſuch Motion. All which he delivers as generally applicable to Motions, produced by any other force, as well as that of *Gravity*; and directed any other way as well as downward.

3. The Doctrine of the *Libra*, or *Ballance* (containing the Fundamental Principles of all *Staticks*;) in Twenty five Propoſitions; among which, he explains the Geometrical Conſiderations requiſite in making both exact *Common* Scales, and the *Roman Statera*.

On this of the *Libra*, depends (that which is the ſubject of the next Part, almoſt finiſht at the Preſs) the whole Doctrine of the *Center of Gravity*, and the Calculation thereof: Which (*Center of Gravity*) he does not onely demonſtrate *to be* (which others have hitherto Poſtulated, but not any, that I know of, demonſtrated;) but doth from General Principles ſhew, How by Calculation to aſſign the ſame, in infinite ſorts of Lines, Surfaces, Solids, as well ſuch as are bounded, or take their riſe from Crooked Lines, as thoſe that are bounded onely with Streight Lines and Plains.

And from the General Principles, here laid down, he doth, in his Third Part (which is to follow) derive the Doctrine of the *Vectis* or *Leaver*; the *Trochlea* or *Pulley*; the *Cochlea* or *Screw*; the *Axis* in *Peritrochio*, or ſeveral ſorts of Wheel-work; and other ſuch Mechanical Engins derived from theſe. As likewiſe the Doctrine of *Percuſſion* (on which depends that of the *Cuneus* or *Wedge*; with many other Speculations of a like kinde:) And that of *Reſilition* or *Rebounding*; which (as appears by a ſhort *Specimen* formerly Printed in *Numb.* 43. of theſe Tracts) he derives from a Repercuſſion, either of ſome other Body in Motion, which it meets with, or from the Elaſtick Force or Spring in one or both of the Meeting Bodies, which, being compreſſed by the Colliſion, doth endeavor to reſtore it ſelf by caſting off theſe Bodies, one or both ways. Conſonant to his Principles here laid down in the Tenth, eleventh, and twelfth Propoſitions of his *Firſt Chapter*; where the *Impedimentum* or *Obſtacle* is made ſufficient to retard or ſtop a Motion; but a *vis contraria* or contrary

Force, neceſſary to give an oppoſite New Motion.

In this firſt Book, he illuſtrates all with Eighty Figures, contained in two compendiouſly contrived Plates: And doth, from their proper Principles, demonſtrate many of theſe things, which Writers commonly Poſtulate, or take for granted; but which (to make a ſure Foundation) ought to have been demonſtrated.

II. *NATHAN. HIGHMORI de HYSTERICA & HYPOCHONDRIACA PASSIONE, Reſponſio Epiſtolaris ad Doct. Willis Med. Londinenſem.* Londini, 1670. *in* 4°.

THe occaſion of Writing this Epiſtle, was, That the Learned Dr. *Willis* in his *Pathologia Cerebri* undertakes to confute the Cauſes of the Hyſterick and Hypochondriack Paſſions, as they are aſſigned by our Author in his *Exercitations*, concerning theſe two Symptons, publiſhed *An.* 1660. Who thereupon thought himſelf obliged to write this *Defence*, in behalf of what he had formerly delivered upon this Subject.

The Controverſie, as to the *former* of theſe Paſſions, conſiſts in this, Whether the cauſe of it is to be referred more immediately to the *Genus Nervoſum*, and it be primarily a Convulſive Symptom, depending on the Brain, and the Nerves thereof; or whether it ought to be imputed to the Blood, ruſhing too impetuouſly into and ſtuffing up the Lungs? Hence

Dr. *Willis* aſſerts the former, and objects againſt the latter, of which, the Vindication is undertaken in this *Epiſtle* ; wherein it is conſidered among divers other things. 1. That the Hyſterick Paſſion is not always accompanied with Convulſions ; where alſo the exiſtence of the *Succus nutritius* (on which Dr. *Willis* his Doctrine ſeems to depend) is called in queſtion, and ſeveral Arguments alledged to the contrary. 2. That, if the *Succus nutritius* in the *Nerves*, be by a violent exploſion dilated, and that by the means of *Fixed Salts* mixed in the *Nerves* with *Acid* ones (according to Dr. *Willis* ;) the ſame may happen upon the Concurrence and Conflict of the like Salts in the Blood.

Concerning the *Hypochondriack Paſſion*, the Queſtion between theſe two Phyſitians, is, Whether the firſt and chief cauſe of that diſtemper, be the Weakneſs and Laxeneſs of the tone of the Stomach and its Fibres, whereby a vicious Chyle and Blood is generated, that cauſes ſuch a Fermentation, upon which do enſue Trembling and Palpitations of the Heart, Swoundings, Fear, Sadneſs? &c. This is affirmed, and here further aſſerted by our Author, but denied by Dr. *Willis* ; concerning which, the *Reader* will finde the beſt ſatisfaction in peruſing the Writings themſelves of both parties.

In the mean time he may pleaſe to take notice here, that Dr. *Highmore* in this *Epiſtle*, interſperſes ſome not inconſiderable Remarks concerning the *Uſe* of the *Spleen*, which part he endeavors to free from thoſe im-

imputations it is commonly charged with, being of opinion, That the Blood is originally depraved not by the *Spleen*, but its matter by the *Stomack*.

III. *NOUVELLES* EXPERIENCES *ſur la VIPERE*, *par M.* CHARAS. *A* Paris, 1669. in 8°.

THe Author of this Curious Book, having firſt taken notice therein of divers Obſerveables, he met with in the Diſſection of *Vipers*, and among them, of the *ſalival Glands*, he diſcovered in them as well as in other Animals, and thoſe accompanied with *Lymphatick Veſſels*, paſſing into a greater Veſſel running along and under the ſaid Glands, and diſcharging itſelf into the *Veſicle* of the *Gingiva*, and carrying with it the *Salival liquor*, which he makes to be the ſame with that yellow water in the bag, hitherto eſteem'd venomous, bnt by him reputed a meer harmeleſs *ſaliva*; having, I ſay, preſented his Reader with theſe and many other Anatomical Obſervations upon this creature, he makes it his buſineſs,

1. To prove, that the biting of Vipers, at leaſt of ſuch as are in *France*, are indeed venomous, and proved actually mortal: Where he alleadges many Experiments, made by himſelf in the preſence ef many Phyſitians and others, evincing this Aſſertion; in the recitation of which, he obſerveth not a few remarkable *Phænomena*, ſeen in the Animals, bitten by Vipers, both without, and alſo within them when dead

and

and opened; particularly; that he found all their Vitals and Viſcera freſh and in a good ſtate, but the Blood in all of them, that were opened, either coagulated already and blackiſh, or tending towards coagulation.

2. To confute the opinion of thoſe (and by name of the famous Italian Philoſopher *Redi*, who, a few years ſince, publiſht alſo a Book of *Vipers*) that aſſert, that the Venom of theſe Animals reſides in the Jellow liquor contained in the Bagg about the Vipers teeth; whereas this Author will have it to be in their vexed and enraged ſpirits: which he thinks, he hath ſufficiently proved by wounding ſeveral Animals with ſome of the biggeſt teeth of Vipers, pulled out, and letting into wounds thus made, and rubbing with that reputed poiſonous liquor of the bag; whereupon no ill effects at all have followed. Which he confirms by another tryal, wherein, holding the Jaws of a Viper, and then thruſting its teeth into the fleſh of a living Animal, and letting the Juyce of the bag into the wound, no ill conſequence appeared, conſidering that the angred Spirits of the Viper, in that forced and reſtrained poſture, were kept from paſſing abroad; for the emiſſion of which he ſuppoſeth the freedom of the Animal is required.

3. To recommend, among divers other Antidotes for the bitings of Vipers, the *Volatile Salt* made of them; the vertues of which he exceedingly praiſeth, alledging the Example of a perſon, who being bitten by a Viper, could be ſaved by no other means,

but by ſeveral *doſes* of this Volatil Salt; whoſe preparation he at larg deſcribeth.

This Book is likely to be forthwith tranſlated into English, to be printed for the Stationer, that taketh care of theſe Tranſactions.

IV. *ATHANASII KIRCHERI ARS MAGNA SCIENDI ſive COMBINATORIA.* Amſtelodami. 1669. *in fol.*

THis Voluminous Work is divided into Eleven Books; in which the Author having taken ſome pains to ſhow the Defects and Difficulties in the famous *Lullian* Art, pretends by a new and Univerſal Method, that is, by an Artificial Combination of the Subjects of knowledg, to enable men to diſcourſe and diſpute, innumerable ways, of every thing propoſed, and to acquire a ſummary and general knowledge of all things. So that his *Combinatory* Art, as he cals it, conſiſts chiefly in this, that any ſubjects being given or propoſed, it ſhews, how often and how many ways they may be combined together, or exchanged, or tranſpoſed among themſelves.

Of this *Art* he firſt ſhows the Theory, and the Rules, in the firſt 5 Books; and then in the other 6. he applyes theſe Rules to Practice by Examples, relating to the ſeveral Arts and Sciences.

Of what Uſe this Doctrine may be for the attainment of knowledg with more eaſe or advantage, the ſagacious Reader may Judge.

V. *LE SYSTEME GENERAL DELA PHILOSOPHIE*, *par* Francois Bayle D. *M.A* Thoulouze, 1669. *in folio.*

THis ſmal Tract, conſiſting only of 4. Sheets, may ſerve to initiate thoſe, that deſire to be acquainted with the ſum and import of the *Carteſian* Philoſophy. It delivers, in 11. Chapters, theſe 11. Heads: The Metaphyſicks of that famous Philoſopher; his Logick; Principles of Natural Philoſophy in general; his Doctrine concerning the Productions made in the Bowels of the Earth; concerning Meteors; Senſible Qualities; Plants; Animals; Man; Humane Paſſions; and Ethicks.

VI. *THEODORI KERCKRINGII D.* M. *SPICILEGIUM ANATOMICUM*, *continens Obſervationum Anatomicarum rariorum Centuriam unam*, *nec non* OSTEOGENIAM *FÆTUUM*. Amſtelodami, *A* 1670. *in* 4°.

THis ſeems to be a very Curions Collection; to which the Author premiſeth in the *Preface* his opinion concerning the R*enes ſuccenturiatos*, viz. That they ſeem to be Caſes, wherein is elaborated a Bilious Juyce; which afterward by the Emulgent veine, or often immediately, paſſeth to the *Cava* and thence conveyed to the Heart, raiſeth there that Effervefcence, which *Sylvius* contends to be in that part excited by the mixture of a ſaltiſh liquor with an Acid: for although Experiment do contradict the Conveyance of the Juyce out of the Liver, through the *Cava*, yet (*ſaith he*) may that efferveſcence in the heart (on which the whole Syſteme of *Sylvius* is grounded) ſtill hold, if this opinion about the uſe of theſe Kidneys be true, eſpecially ſince there needs but little *Leven* to ferment a great Maſs; there being required but a very little Salt of *Tartar* to be mixt with a good quantity of Spirit of *Vitriol*, to cauſe a vehement and durable Fermentation, though a conſiderable plenty of the latter, mingled with a ſmall quantity of the former, produceth but a languid and ſhort Efferveſcence.

As to the *Collection* it ſelf, it conſiſts of divers uncommon, and very conſiderable Remarks, delivered by the Authors own Obſervation; *E. G.* A *Dutch Stuyver* ſwallowed down, and by cloſing the *Pylorus* of the Stomach, killing the Patient in ten days; on the contrary, a ſmall Braſs-coyn being ſwallowed, was after a Moneths time voided by Purges, and the Patient ſaved, the Coyn being ſo worn in the Stomach, that the ſame hardly appeared: *Item*, Of a Tumor on the Back, reſembling a Sack filled with Corn, formed there by the force of Imagination: Examples of Superfœtation, and Ambiguous Births; of Animals bred in the Ear, and Worms come out of the Noſe; of two Niples in one Breſt; of divers very odd Monſters; of Infants born with Teeth; of a periodical ſpitting of Blood; of Stones growing upon the wind-pipe, in the Brain, and the Heart, and killing the Patients; of a double *Vena Cava*, of a treble *Ductus Thoraci-*

cus; of four Spermatick Arteries found without Spermatick Veins; of a portion of a *Secundine*, voided uncorrupted and innoxiouſly, four Moneths after the production of the Childe; of a Woman, frighted by the prediction, made by a Beggar, of the day of her death, and dying on that very day; of a very ſtooping and crooked Man, not above forty years of age, made ſtreight again by purging away tough humors, beſiedging the Muſcles; of a Boy, and of ſeveral Sheep deſtitute of Brains; of many Obſervables in one and the ſame Body; of various complicated and odd Diſeaſes in one Patient; of a Woman gone about ſeven Moneths, who being exceedingly frighted at the hearing of her Daughters falling down Stairs upon her Head, and breaking the hind part of the Skull, was a few days after delivered of a dead childe, wanting the whole Bone of the ſame part; of the *Catamenia* flowing thorow the Crown of the Head; others, thorow the right hand; others, from the very time of a Childes Nativity; of a Childe incloſed in a *Mola*; of a means of reſtoring the Sight, deprived of its Chryſtalline, and the other Humors.

The other part of this Book treats of the gradual and ſucceſſive Growth of the Bones in a *Fœtus*; for the better obſervation of which, the Author affirms to have by him *Sceletons* from the ſecond Moneth after the Conception, to the very Ninth Moneth, aſſuring the Reader, that he delivers nothing, but what he knows by his own clear inſpection; which he performs in ſuch a manner, that he onely relates the more rare particulars, wherein the *Fætuſs* do differ from *adult* Bodies, or he in the Doctrine of the Bones of *Fætuſs* from other Authors, or which being un-obſerved of others, he hath obſerved more accurately; now and then alſo confirming, what others, by reaſon of the odneſs of the thing, yet doubted of. In ſhort, he deduces the increaſe of the Bones through their ſeveral intervals of Times, and gives an accompt, How they are conſtituted in the firſt two Moneths, in which there hardly appeareth any thing of Bones diſtinguiſhable; then what of them, about the Third, fourth, and the reſt of the Moneths, is ordinarily changed, added, or taken away, at leaſt in the *Fætuſs* of theſe Climats. The ſum is, That there is a Tranſmigration of Membranous parts into Cartilagineous, and from them into Bony ones; performed by Nature with ſuch ſilent ſteps, that the moſt quick-ſighted, and the moſt patient Eye ſhall never ſee it doing, though it may evidently ſee it done.

ERRATA in Numb. 53.

PAg. 1062. l. 1. r. *Durtwich*, p. 1064. l. 4. r. *two pounds four ounces and an half*, ibid. l. ult. r. *or chiefly*, p. 1066. l. 26. r. *with a lower hole*, p. 1067. in Fig. 3. r. *The Book with*, p. 1074. l. 17. r. *throughly inured*.

ERRATA in this Numb. 54.

P. 1076. l. 17. r. *Denys's Advocat very*, p. 1088. l. 26. r. *ways ; conſonant*.

Printed by *T. N.* for *John Martin*, Printer to th
Royal Society, and are to be ſold at the Bell
a little without *Temple-Bar*. 1669.

Numb. 55.

PHILOSOPHICAL TRANSACTIONS.

January 17. 1670.

The Contents.

An Accompt of ſuch of the more notable Celeſtial Appearances of the Year 1670, *as will be conſpicuous in the* Engliſh *Horizon; and among them, an* Eclipſe of the Sun, *in part viſible here in* England, *though pretermitted, as ſuch, by others; as alſo of divers* Stellar Eclipſes, *to be cauſed by the Moon, covering ſeveral Fix'd Stars. Some Obſervations concerning the Barometer and Thermometer, made by Dr.* Beale *in* Somerſet; *and others of the like nature, made by Dr.* John Wallis *in* Oxford. *An Accompt of a ſmall Tract, entituled,* THOMÆ HOBBES Quadratura Circuli, Cubatio Sphæræ, Duplicatio Cubi, (*Secundo Edita,*) Denuò Refutata, A. JOH. WALLIS, *S. T. D.* &c.

An Accompt
Of ſuch of the more notable Celeſtial Phænomena *of the Year* 1670, *as will be conſpicuous in the Engliſh Horizon; written by the Learned and Induſtrious Mr.* John Flamſtead *Novemb.* 4. 1669. *and by him addreſſed and recommended for encouragement, to the Right Honorable, the Lord Viſcount* Brouncker, *as Preſident of the* Royal Society.

My Lord,

AMong thoſe many Illuſtrious, Noble, and Generous Perſons, who have the honour to be in the Liſt of the *R. Society*, I find numbered ſome Aſtronomers, whom our Age accounts its Glory, and our Arts their Support: which induces me to believe that among all thoſe Ingenuous Arts and Sciences, which have put themſelves under their Patronage, and look for an improvement from their Induſtry, the *Celeſtial* are not to be accounted the laſt. Their Excellent Hiſtory ſhews, that they have not neglected the *Heavens*. And their endeavours for the Improvement of *Optick Glaſſes*, and Encouragement of ſuch as labour therein, do more than obſcurely indicate thoſe high reſpects they have for the Sublimeſt of Human Sciences, *Aſtronomy*.

Theſe conſiderations invited me to addreſs myſelf, with theſe my following labours, to your Honor, who hold ſo high a place in that illuſtrious Body, and are known to excel in the knowledge as well, as the Love of that Science, I ſtand ingaged in. You know, *My lord*, How much it conduceth to the Advancement of *Aſtronomy*, and the Correction of our *Canons*, to have the Celeſtial Appearances accurately obſerved, and how much it concerns the Obſerver to have notice of what *Phænomena* the Heavens exhibit convenient for his Obſervation. I have endeavoured in the following pages to accommodate him with the Calculations of ſuch of the more notable *Phænomena* of the Year 1670,, as will be conſpicuous in the Engliſh Horizon, if the Heavens be clear; and ſhall, God willing, performe the like for future Years, if I may be but encouraged by the acceptance of theſe

I was excited to this task by peruſing the *Mercurius in Sole viſus* of the Excellent *Hevelius*, who hath oblieged Aſtronomy by his accurate Obſervations of the *Moons tranſits* by and over *Saturne*, and her occultations of *Spica Virginis*, and the *Clara in fronte Scorpii*. I ſaw nothing to hinder Us from performing as much, ſince we cannot want inſtruments, at leaſt, as good as His, if we had but the like induſtry, and notice alſo of the time, when the Appearances would preſent themſelves. Though I was not furniſh't with very fit Inſtruments, yet hoping, that I might do ſomewhat worth my labour, I revolv'd Mr. *Wings Ephemerides* for this year, to find, what Stars the *Moon* might cover, and how often, in her Revolution. Thoſe Occultations, which I collected might be conſpicuous, I re-calculated from the exacteſt Tables, I know in being, the *Caroline*, of Mr. *Street*, and theſe I ſhall here preſent you with at large. Theſe Supputations, when I firſt framed them, I fitted to the Meridian of my habitation, intending them only for my own private uſe; but upon ſecond conſideration, finding, how much the Obſervations, if rightly and accurately performed, might conduce to the better ſtating the Dimenſions of the Moons Orbite, and ſolving the Irregularities of ſeveral *Phænomena*, I reſolv'd to communicate them to the Ingenious, and to deſire their utmoſt care in obſerving theſe Appearances, which I had not un-accurately calculated. And I now humbly proſtrate them to their peruſal, deſiring, that, if they ſeem worthy, you will be pleaſed to impart them in ſuch a way, as you ſhall think fit, to ſuch intelligent and induſtrious perſons either of the R. *Society*, or others, as will be accurate in their Obſervations, and willing to communicate what they ſhall have obſerved,

I hope, *My Lord*, you will not account me faulty for having adapted the Calculations to the *Meridian* of a place no more famous than *Derby*. You had the occaſion before; to which I may add, that the *Meridian* paſſing over *Derby* is nearer the middle of *England*, than that of *London*; and that its *Latitude* bi-ſects it nearer, than any yet ſtated: So that this Town, which is ſeated in *Umbilico quaſi Regni*, muſt needs be the moſt convenient place, that can be choſen, where-on to fix our Calculations. For, the diſtance of any place within this kingdom from it, will not much vary the manner of their Appearance in any of the *Phænomena*, except the Eclipſe of the Sun: for, in the Occultations, the Stars will appeare to paſs nearly under the ſame Angles and Spots of the

Moon; nor will the times of the *Phaſes*, or the *Moræ ſub Luna* differ much in any place of the Kingdom; nor at all, if a due conſideration be had of the *Differences* of *Meridians*, and the *Laws* of *Parallaxes.*

I come now to the *Phænomena* themſelves. Mr. *Wing's Ephemerides* and others tell us, that we ſhall have but one Eclipſe, and that of the Moon, conſpicuous this Year. But, *pace hujus Aſtronomi*, I dare affirm, that a part of an Eclipſe of the Sun will, if the weather permit, be viſible to us alſo: Which I have therefore calculated from the *Caroline Tables* to the *Meridian of Derby*, whoſe *Longitude* from *London*, I have us'd in this Eclipſe, is 6 min. to the Weſt, and *Latitude* 52 deg. 57 min.

By which Tables on Saturday *April 9th.* at the time of Sun-ſet, ſuppoſed at 7 *ho.* 3 *minutes P. M.* I find,

		ſ.	d.	m.	ſec.
The Suns Mean Anomaly		9	21	13	52
The Moons Mean Anomaly		7	9	31	43
The Place of her Apogeum		5	7	40	31
The Place of her Node		0	21	38	20
The Suns true place,		♈	29	55	25
The Moons true place,		♉	0	23	46
With North-Latitude			0	45	47
The Point culminating,		♌	11	6	29
The Horoſcope,		♏	0	1	20
The Altitude of the Moons Center			0	44	10
The Parallactical Angle			33	55	35
The Parallax of the Moon from the Sun in	Altitude		0	59	39
	Longitude		0	49	30
	Latitude		0	33	18
Therefore the Moons viſible place,		♈	29	34	16
In Antecedence of the Sun			0	22	9
With Viſible North-Latitude			0	12	29
The diſtance of the Sun and Moons Centers			0	24	34
The Suns Semi-diameter			0	15	49
The Moons Semi-diameter			0	16	7
Summe			0	31	56
Parts defective			0	7	22
			dig.		
Therefore the digits darkn'd			2	47	40
The Inclination of this *Phaſis* above the Ecliptick, is			0	30	33
			deg.		
And from the Suns Zenith			115	31	33

By this *Calculus* it appears, that the Sun is ſo far from not being eclipſed, that he is obſcured near 3 digits in the ſetting.

Now to find, when the Eclipſe begins, I re-calculate the places of the Sun and Moon to 6 *h.* 46 *m.* *P. M.* and inveſtigate

			d.	m.	ſec.
The Suns place,		♈	29	54	44
The Moons place,		♉	0	13	19
With North-Latitude			0	44	50
The Mid-heaven,		♌	6	54	28
The Point deſcending,		♈	27	6	10
The Altitude of the Moons Center			3	1	14
The Parallactical Angle			33	7	40
The *Parallax* of the Moon from the Sun in	Altitude		0	59	33
	Longitude		0	49	56
	Latitude		0	32	54
The Moons Viſible place,		♈	29	23	23
With Viſible North-Latitude			0	12	16
Leſs then at 7 *h.* 3 *m.* by			0	0	13
Ergo, The Angle of the Moons viſible way with the Ecliptick			1	8	26
The Angle of Incidence in the beginning			23	48	18
Motion ſeen from 6 *h.* 46 *m.* to the inchoation			0	1	53

Therefore the time of the beginning, *6 h. 49 min. P. M.* The firſt contact will appear 122 *d.* 55 *m.* from the Suns Zenith. And *I* am perſwaded, that this *Calculus* doth exhibite this *Phænomenon* nearly, as it will appear unto us. And *I* queſtion not, but that in and near our *Meridian* it will be obſervable, if the Air hinder not. *It* is an Appearance that will richly merit the accurateſt of our Obſervations. For the Moons mean Anomaly being about *7 Sign.* 11 *deg.* we may the better judge by the Obſervation, Whether the *Æquations* of her *Orbite* be Oſcillatory, or not. Nor need we ſcruple about the *Æquation* of *Natural days: I* have fully demonſtrated the Æquations, ſo that *I* am perſwaded, no one hereafter will controvert them; and *I* ſhall ere long, if God will, commit them to your and the publick cenſure.

I ſuppoſe the beginning of this Eclipſe may, if the Air be ſerene, appear at *London*; but its *Meridian* being removed to the Eaſt from ours, 5 or *6 minutes*, and its Latitude being leſs, ſo that the Altitude of the *90 deg.* and conſequently the Parallax of Longitude will be greater, and of Latitude, leſs: *It* follows, that the Eclipſe will be retarded, and that only the beginning thereof, ſcarce to *one digits* Obſ~~erv~~curation, will there appear; but in the *North* and the *Weſtern* parts of *England* and *Scotland*, it will appear more fully: and in *Ireland* it will be viſible to the middle of the Eclipſe.

For the well-obſerving of this noble Appearance, *I* need not ſuggeſt the way of caſting the *Species* of the Sun through a good Teleſcope of a competent length, on an extended paper, placed behind the Eye-glaſs ſo far, as that the ſaid *Species* may appear at leaſt *6* inches over; then dividing *both* his *Periphery* into 360 degrees, for the better obſerving the *Inclination* of the *Cuſps* of each *Phaſis*; *and* his *Diameter* into digits, and their parts by Concentrick Circles, for meaſuring the quantities of the obſcured parts. For the meaſuring of time, the skilful Obſerver will be furniſht with good *Quadrants*, *Clocks*, or *Pendulums*.

But to proceed to the Occultations, that may be made by the Moon, of the leſſer Lights; I ſhall take notice, That thoſe Stars, that have not above 6 *d.* 20 *m.* Latitude from the *Ecliptick*, may all of them, ſome time or other, be cover'd by the Moon, in her paſſing through the *Zodiack*: Of which ſort I have numbred, from the *Tychonick Catalogues*, the Stars ſo lying as you ſee in the annex'd Table: And I find in the *Zodiack* 189, with 6 in the *Pleiades*, 12 in the Northern, and 5 in Southern Conſtellations, plac'd out of the Ecliptick; the total is 212. Of theſe the Moon frequently hides one or other, yet no notice taken of it by the *Ephemerides* of our Aſtrologers.

Aries	12	
Taur.	21	
Gem.	21	
Canc.	12	
Leo	22	
Virg.	18	
Libr.	12	
Scorp.	8	
Sagitt.	14	
Capr.	20	
Aquar.	16	
Piſc.	13	
For. Auriga	5	*Bor.*
Ophiuch.	7	
Cete	3	*Auſt.*
Orion.	2	
Pleiad.	6	*Bor.*
Sum	212	

It would be too large a labour for one man to undertake the calculating of all the Occultations obſervable in this year, nor is it perhaps ſo needful: for, the Stars of the 5th and 6th Magnitude are more numerous, nor ſo accurately (I doubt) rectified, and the Moon approaching them within 4 or 5 degrees, abſconds them to the naked eye; and if the Obſervation be undertaken with a Teleſcope, other ſmaller Stars may be miſtaken for thoſe, the *Calculus* intends, and ſo both the Obſerver deluded, and the Art prejudiced.

But the Moon will ſeveral times this year cover two noted Fix'd Stars; of which, that I may gratifie the Curious, and excite the Induſtrious to the like endeavors, I ſhall give here the *Calculus* of the Occultations and Tranſits, from the *Caroline* Tables.

I. The firſt Occultation almoſt uſhers in the Year*: For on *January* 2. in the morning, the Star, called *Præcedens illarum quatuor in ala Virginis Auſtrina*; may be covered with the Moons Southern limb. But fearing, that this Appearance will ſcarce be conſpicuous, becauſe the approaching light of the Sun will ſeize the Star before the beginning of the Occultation, I forbear to calculate it.

II. The next obſervable Occultation will be on *February* 25. a little before 8 at night; the Moon then again covering the ſame Star in the *Virgins* South-wing: For which take this *Calculus* from the *Caroline* Tables; wherein I have ſupputed the Moons viſible place to 7 *h.* 28 *m.* and 8 *h.* 18 *m. P. M.* at *Derby*, ſuppoſing its Longitude to the Weſt from *London* 5 *m.* 30 *ſec.* and its Latitude, as *I* obſerv'd it, 52 *d.* 58 *m.*

	To 7 *h.* 28 *m.*				*To* 8 *h.* 18 *m.*			
	ſ.	*d.*	*m.*	*ſec.*	*ſ.*	*d.*	*m.*	*ſec.*
The Moons Mean Anomaly	0	18	4	3	0	18	31	16
The Moons true place	♍	29	15	4	♍	29	39	45
The Argument of Latitude	5	5	55	34	5	6	21	43
The Moons true Latitude North		2	2	33		2	0	29
Semidiameter							14	22
~~Her Horizontal Parallax~~ The ſuns true place	♓	17	35	47	♓	17	51	
The Suns right Aſcenſion		348	36			348	38	
The right Aſcenſion of the Mid-heaven		100	36			113	8	
The Mid-heaven	♋	5	44		♋	21	23	
The Horoſcope	♎	7	18		♎	15	39	
The Angle Orient		60	17			59	13	
The Moon from the Aſcendent in the Eclipick		8	3			16	19	
In a great Circle		8	18			16	26	
The Altitude of the Moons Center		8	0			15	1	
Her Azimuth from the Aſcendent		2	16			6	45	
Her Parallactical Angle		29	47			31	26	
The Moons Parallax in Altitude			52	46			51	33
The Moons Parallax in Longitude			45				43	59
The Moons Parallax in Latitude			26	13			26	54
The Stars place *Libra* 0 *d.* 10 *m.* 19 *ſec.* with Latit. Boreal.						1	25	0
The Moons viſible place	♎	0	0	52	♎	0	23	44
With viſible Latitude North		1	36	20		1	33	35
In Antecedence of the Star			9	27	*in conſeq.*		13	25
With greater Latitude North			11	20			8	35

---

* *This Diſcourſe came too late to hand, for giving timely notice of this* Phænomenon; *though nothing be loſt by this loſs of time, as appears by the Advertiſement it ſelf.*

	d.	m.	ſec.
Her viſible Motion from 7 *h.* 28 *m.* to 8 *h.* 18 *m.* is	0	22	52
The difference of the Moons viſible Latitudes	0	2	45
The Angle of the Moons viſible way with the Eclip.	6	51	27
Her viſible Latitude at the apparent Conjunction	1	35	12
The Angle of Immerſion beneath a ſtraight line drawn through her Center parallel to the Ecliptic —	51	33	3
Motion from the *I*mmerſion to the viſib. Conjunct.	0	9	1
The Angle of Emerſion beneath the parallel	37	42	5
The viſib. Motion from the o *m.* to the Egreſs appar.	0	11	30
Apparent Mot. from 7 *h.* 28 to the Immerſion	0	0	36
Apparent Mot. from 8 18 to the Stars Egreſs	0	1	55
The time from 7 28 to the Sub-ingreſs	0	2	9
The time from 8 18 to the Stars Emerſ.	0	4	22

Therefore the Sub-ingreſs	7	29	6.
Emerſion	8	13	38.
The Stars *Mora* under the Moon	0	44	32.

The Stars Latitude from a line drawn over the Moons Center parallel to the Ecliptick	in the	*I*mmerſion	11	17
		Egreſs	8	50

Over what Spots of the Moon, the ſeeming way of the Star would paſs, *I* do not here ſhew, becauſe I dare not rely on our Selenographical Tables. *I* proceed therefore to the next.

III. March 3. in the morning, the Moon paſſeth over *Antares*, or the *Scorpions heart*, whoſe Longitude to the *Caroline Author* is then *Scorpio* 5 *deg.* 7 *m.* 20 *ſec.* and Latitude South 4. 27. The Ecliptical Conjunction by the *Ephemerides* was *March* 2. 16 *h.* 54 *m. P. M.* Wherefore, for the better inveſtigating the times of the beginning and end of this Occultation, *I* have calculated the true and viſible places of the Moon to 16 *h.* 39 *m.* 52 *ſec.* and to 17 *h.* 49 *m.* 52 *ſec. P. M.* by the ſaid Tables to the Meridian and Latitude of *Derby*, as follows;

	To 16 *h*. 39 *m*. 52 *ſec*.				To 17 *h*. 39 *m*. 52 *ſec*.			
	ſ.	*d*.	*m*.	*ſec*.	*ſ*.	*d*.	*m*.	*ſec*.
The Moons mean Anomaly	2	28	22	56	2	29	1	3
Her true place	♐	4	41	0	♐	5	18	18
The Argument of Latitude	7	12	4	41	7	12	40	10
The Moons true Latit. South		3	32	0		3	34	30
The Horizontal Semi-diameter			15	21			15	21
Parallax			56	45			56	45
The Suns true place	♓	22	57	21	♓	23	0	15
The Suns right Aſcenſion		353	32			353	35	
The right Aſcenſion of the Mid-heaven		243	30			261	3	
The Mid-heaven	♐	5	26		♐	21	47	
The Horoſcope	♒	3	10		♒	7	31	
The Angle Orient		18	42			14	15	
The ☽ from the Aſcend. in the Eclipt.		58				87	47	
In a great Circle		58	33			87	47½	
The true Altit. of the Moons Center		19	21			17	45	
Her Azimuth from the Horoſcope		56	26			87	40	
Her Parallactical Angle		79	47			89	26	
Her Parallax in Altitude			53	50			54	18
Her Parallax in Longitude			9	33			9	32
Her Parallax in Latitude			52	59			54	18
Therefore her apparent place	♐	4	50	33				
In Antecedence of the Star			16	47	in conſ.		10	26
With Latitude South, then the Star leſs			2	1	more		1	48
So her viſible motion to 1 *h*. 10 *m*. is						0	27	13
The difference of her Latitudes						0	3	49
The Angle of her viſible way with the Ecliptick						7	59	0
The Angle of Incidence under a parallel line to the Ecliptick						6	45	32
Angle of emerſion above the line drawn by the Moons Center						9	12	28

	h.	*m*.	*ſec*.			
The apparent motion from	16	39	52.	to the ſub-ingreſs	1	27
The apparent motion from	17	39	52.	to the emerſion	4	49
The time from	16	39	52.	to the ſub-ingreſs	3	46 *t*
	17	39	52,	to the egreſs of the Star	13	32

		h.	*m*.	*ſec*.	
Therefore at *Derby* the	ſub-ingreſs	16	43	18	P. M.
	emerſion	18	0	24	
The Stars *Mora* under the Moon		1	18	46.	

		m.	*ſec*.	
The Stars Latitude from a line drawn through the Moons Center parallel to the Ecliptick in the	Ingreſs	1	54	South
	Egreſs	3	7	North

At the middle of this Stellar Eclipſe the Moons Center is but 20 *ſec.* more to the South than the Star; ſo that, if the Libration of the Moon be known, the protraction of the Star's way in this Appearance will be facile. And this *Phænomenon* is highly worth our ſtricteſt Obſervations; for, the Moon being almoſt in her *Mean* diſtance (where there is no great difference among Aſtronomers about her primary æquations) we may the more ſecurely judge of her *ſecond* inæqualities, and perhaps diſcover a *third*, which may promote the Moon, and accelerate the times in this Appearance. If diligent heed be given to the times of the ſub-ingreſs and emerſion of the Star, and with what Spots on the Moons face it keeps in a right line, we may be well aſſiſted, by the obſerued *Mora* to judge of her *Diameter*; for *I* queſtion not, but her Apparent Horary Motion, may, with ſome little trouble, be exactly enough inveſtigated either from the *Wingian* or the *Caroline* Tables.

IV. March 24. *h.* 15. 35 *m. P. M.* by the *Ephemerides*, the Moon will be in the ſame *Longit.* with the fore mention'd Star *in ala Virg*; with almoſt 2 degrees *North-Latitude*: whence at firſt *I* expected an Occultation; but upon a better *Examen I* find the *Caroline* Tables only preſent a *Tranſit*, as I ſhall prove by this *Calculus*, framed to the *Meridian* and *Latitude* of *Derby*: by which at 15 *h.* 42 *m.* 24 *ſec. P. M.*

	ſ.	*d.*	*m.*	*ſec.*
The Moons *Mean* Anomaly is	0	15	10	37
Her true place	♎	0	5	33
The Argument of Latitude	5	6	38	46
The Moons true Latitude North		1	59	16
Her Horizontal Parallax			52	49
Her Horizontal Semi-diameter			14	17
The Suns Right Aſcenſion		13	28	
The Right Aſcenſion of the Mid-heaven		249	4	
The Mid-heaven	♐	10	41	
The Horoſcope	♒	12	31	
The Angle Occident		16	58	

	ſ.	d.	m.	ſec.
The Moon from the Horoſcope in the Ecliptick		47	34	
In a great Circle		47	36	
Her Azimuth from the Horoſcope		45	53	
The Altitude of her Center		14	23	
Her Parallactical Angle		78	17	
Her Parallax in Altitude			51	21
Her Parallax in Longitude			10	25
Her Parallax in Latitude			50	17
Hence her viſible place	♍	29	54	48
With viſible North-Latitude		1	8	59
Therefore ſhe is in Antecedence of the Star			15	25
With leſs North-Latitude			16	1

Now the Moons Semi-diameter being only 14 *m.* 17 *ſec.* it appears, that the Star is more to the North, than the Moons Limb, by 1 *m.* 44 *ſec.* and the Moons Latitude decreaſing together with the Altitude of the 93d degree, cauſeth the *Apparent* Motion to be viſible in a line bending down from the Star; ſo that near the viſible Conjunction the Star may ſtand about 3 *min.* to the North from the Moons Limb. Though this be not like to prove an Occultation, yet let me deſire thoſe, who have fit Glaſſes and Inſtruments, to obſerve this *Tranſit*, and how far the Star may ſtand from the Limb of the Moon at the time of the viſible Conjunction, that we may be the better enabled to define, *both* how the Motion of the Moon's Latitudes, which ſhall need its limations, is to be reform'd, *and* whether that Æquation of the *Nodes*, allow'd by the *Caroline* Author and ſome other Moderns, be firm and valid.

V. The laſt Occultation happens on *May* 23; when 12 *h.* 17 *m.* *P. M.* by the *Ephemerides* the Moon will be in Conjunction with *Antares.* To define the Beginning and End of it, I have ſupputed the Moon's true and viſible places to 12 *h.* 28 *min.* 42 *ſec.* and 13 *h.* 43 *m.* 40 *ſec. P. M.* at *Derby*, by the *Caroline Tables*, and I find,

					To 12 h.28 m.42 ſec.			*To 13 h.43′.40″.*
	ſ.	d.	m.	ſec.	ſ.	d.	m.	ſec.
The Moons mean Anomaly	2	17	23	52	2	18	4	41
Her true place	♐	4	52	48	♐	5	33	41
The Argument of Latitude	7	15	12	26	7	15	56	11
The Moons true Latitude South		3	33	0		3	35	37
The Suns true place	♊	12	30	43	♊	12	33	42
The Suns right Aſcenſion		71	2½			71	5	
Right Aſcenſion of the Mid-heaven		258	13			277	0½	
The Mid-heaven	♐	19	10		♑	6	25	
The Horoſcope	♓	1	0	*aſc.*		17	48	*deſc.*
The Angle Orient		14	41			13	56	
The Moon is diſt. from the Horoſcope		86	7			47	52	
The true Altitude of the Moon's Center		18	11			13	49	
The Azimuth from the Horoſcope aſc.		85	55			46	18½	*deſc*
Her Parallactical Angle		88	58			80	25	
The Moons Parallax in Altitude			52				54	1
R1054 The Moons Parallax in Longitude			0	57			8	59
The Moons Parallax in Latitude			52	52			53	16
So the Moons viſible place is	♐	4	53	45		5	24	42
With viſible South-Latitude		4	25	52		4	28	53
In Antecedence of the Star			13	46	in conſ.		17	11
With South-Latitude than the Star leſs			1	8	greater		1	53

So the Moons viſible motion to 1 *h.* 14 *m.* 58 *ſec.* is					30	57
The difference of her apparent Latitudes					3	1
The Angle of her way with the Ecliptick				5	34	0
The Angle of Incidence, under a Parallel to the Ecliptick, through the Moons Center				4	46	32
The Angle of Emerſion above the ſaid Parallel				6	19	28
	h.	*m.*	*ſec.*			
Motion ſeen from the Sub-ingreſs to	12	28	42 is		1	12
Motion ſeen from the Emerſion to	13	43	40 is		2	16
Time from the Sub-ingreſs to	12	28	41 is		2	54ſ
Time from the Emerſion to	13	43	40 is		5	28ſ
Therefore the Stars Sub-ingreſs at	12	25	48			
Therefore the Stars Emerſion at	13	38	12			
The Star's *Mora* under the Moon	1	12	24			

		m.	*ſec.*
The Latit. of the Star from a line drawn parallel to the Ecliptick over her Center in the	Sub-ingreſs	1	15 South.
	Emerſion	1	40 North.

In this Occultation, as in the preceding, the Center of the Moon paſſes very near the Star, ſo that we may well hereby define, as was advertiſed in the laſt Occultation, both of her *Diameter*, and of the places and *æquations* of her *Nodes*. For in *this*, at 12 *h.* 28 *m.* 42 *ſec. P. M.* the mean Node was in *Aries* 19 *d.* 19 *m.* 34 *ſec.* and the æquation of the Node to be added, 26 *m.* 52 *ſec.* which makes the true Node *Aries* 19 *d.* 46 *m.* 26 *ſec.* But in that of *March* 2 at 16 *h.* 39 *m.* 52 *ſec.* the mean Node was in *Aries* 23 *d.* 39 *m.* 33 *ſec.* the æquation was 55 *m.* 59 *ſec.* to be ſubſtracted; ſo the true Node was in *Aries* 22 *d.* 43 *m.* 34 *ſec.* Now if this Æquation of the Nodes ſhould be neglected, it might make about 5 *min.* difference of the Latitudes, which I have here collected. The Ingenuous therefore will obſerve with all poſſible accuracy, both under what ſpots of the Moon the Stars ſhall enter and emerge in theſe and all other Occultations; and they will note the Times exactly, conſidering the benefit, that will thence accrue to Aſtronomy. The Obſervers muſt not content themſelves with the times acquired by Clocks or rectified Watches, but alſo take the Altitudes of ſome fixt Star, free from Refraction, and remov'd from the Meridian both at the beginning and end of the Occultations, with exact Inſtruments of Braſs well divided.

So far this diligent Author for this time. The other particulars, contained in his Papers, may perhaps be publiſht hereafter. We were to reſerve a part of this Tract for ſome other Communications.

Some Obſervations
Concerning the Baroſcope and Thermoſcope, made and communicated by Doctor *I.* Wallis *at* Oxford, *and Dr.* I Beale *at* Yeovil *in* Somerſet, *deliver'd here according to the ſeveral* dates, *when they were imparted.*

Dr. Beale *in thoſe Letters of his dated* Decemb. 18. *Decemb. 29. 1669. and Jannar. 3.* 16$\frac{69}{70}$.

HAving not look'd upon my Barometer a long time, I did by meer chance caſt my Eye on it upon Munday laſt, *Decem.* 13. 1669. about one of the Clock p. m.; and juſt then I ſaw the Quickſilver higher, than I dare poſitively affirme that it was ever ſince I had it in my cuſtody, *viz.* ſince *May* 28, 1664. It was compleatly and apparently above half an inch more than thirty inches high. I called younger men to examine it over and over very carefully, by a meaſure, taken exactly from the ſtandard-foot of *London*, both in Braſs and in Box. They meaſured it often from that time, which was Munday, and late in the night of that day; then on Tueſday morning early; oft-times in the day, and late at Night: alſo ſome part of Wedneſday. In all which time, when it was loweſt, it was (as I ſaid at firſt) compleatly 30 ½ inches; ſometimes manifeſtly higher to the eigth or tenth part of a inch.

For this Baroſcope I have two Glaſs-canes in one veſſel of ſtagnant Quickſilver. They are of equal length, not fully two inches higher, than the Mercury aſcended, and no Bolt-head to either of the Glaſſes. The one hath not been moved theſe two or three years, and hath a tincture of the Mercury on the empty top, as from the ſteams of the Mercury in ſome hot Summer; the other Glaſs was placed there about a year and an half agoe. This hath no tincture on the top. Both agreed in this Indication, as others affirme; but, to my Eye, in the latter Glaſs the Quickſilver ſeemed to be ſomething higher.

The Weather was at firſt diſcovery very bright and clear: a gentle froſt, by the Suns heat melting. The Air was very ſilent, no wind ſtirring, and the curious Wind-vane noting, that the wind was directly in the *Eaſt* all the firſt day (*Decemb.* 13;)

on *Decem.* 14. the wind had a ſhort ſwing from the *North-weſt*, and haſtened again toward the *Eaſt*, yet ſo as to be *North-Eaſt*. During this agitation, or change of Winds, the Mercury deſcended a little; and after, upon the reſetling of the wind, the Mercury aſcended a little higher, than it had been the day before.

My Houſe and Study, where I keep this Baroſcope, is on the ſide of an Hill; on the higher ſide of this Country, as I gueſs near a level with the Head of a River; which River, running ſlowly, and falling into the *Severne*-ſea about 20. or 30. miles Weſt-ward of *Briſtol*, we cannot be very much above the level of the Sea.

My Thermoſcope, ſtanding cloſe by my ſaid Barometer, was at the juſt hight of ordinary diſſolving Weather. In the following dayes it was colder. Whether the late Summer-drought, or what elſe, might incline this Winter-air to have more than ordinary Weight, or a ſtronger Spring, I muſt refer to the conſideration of the more skilful. And if you pleaſe to give notice for a general Obſervation, what Springs do now moſt fayle, or more abound in any Vertue, Quality, or Quantity, it may probably be inſtructive for divers inferences; and particularly, it may give ſome degree of indication, Whether the Springs proceed from the fall of Rain, or by Subterraneous paſſages from the Seas, or by change of Air into Water.

But to returne to my Thermometer, I ſhall give you further notice, that on *Decemb.* 26. 1669. in the Morning, the Weather was colder than ever I found it, ſince I could take it by the meaſure of a Thermometer, that is, ſince theſe 5. or 6. years. It was very cold and frezing quick ſome dayes before, and ever ſince: And yet in this time the Mercury hath ſometimes faln more than an Inch, without any other change of Weather, than ſome guſts of wind, ſome ſprinklings of Snow * at ſeveral times, in all, ſcarce enough to cover the ground; and ſome abatements of Cold more eſpecially when the Sun was up.

I have examined my *Ephemeris* from May 28. 1664. till now: In all which time I find it not remark'd for any ſuch de-

* *This was written before the great Snow fell.*

gree of Cold, as hath been, ſince *Chriſtmas* began, and continues every Night and Morning to this very day of *Decemb.* 29; though the extremeſt was, as hath been ſaid, on *Decemb.* 26. To note this degree of Cold more particularly, I muſt acquaint you, that in my ſtanch Thermometer on the ſaid 26 of *December*, the Liquor was at *three* inches and an *half*. This morning (*Decemb.* 29) and one or two other mornings it was at *three* inches and *three quarters*. Moſt other times of theſe Cold days, Morning and Evening, it was at the height of *four* inches, in ordinary Briſk Froſts it is at *ſeven* inches. Yet here I muſt obſerve, that ſometimes the Froſt diſſolves, when it is at the 7th figure, and ſometimes I find it at the 8th figure in a ſmart froſt: Whether the Winds, which come not to the Thermometer, may cauſe this difference, or what elſe, I know not. But to proceed, 'tis warm *May*-weather, when 'tis at the 10th figure, and 'tis not much above the 12th figure in the hotteſt weather of *June, July*, and *Auguſt*. To compare with former Winters, the loweſt mark is upon *Decemb.* 17. 1665; and then it was at the height of *five* inches and an *half*. And in *Decemb.* 31. 1666, it was about the ſame height; and there I find theſe words; *Very cold, above all of this year, hitherto.* Neither do I find any note ſo low, till this preſent, which is conſiderably lower.

I think it remarkable, that the 7th Inch, and ſometimes the 8th in my Thermometer ſhould abide Freezing, and the Froſt increaſe, till the Liquor deſcended 4½ inches; and yet, that it ſhould not aſcend from the 8th inch more, than 4½ inches in our hotteſt Summer, being hung in the ſame place within 18 inches of the Glaſs-window, facing the *North-weſt*, and in a little Writing-room, in the ſecond row of Buildings. But now I am ſtrongly perſwaded, that the degrees of Heat and Cold are not exactly indicated by the incloſed *Spirit of Wine*: For, when the Snow melted, and the Froſt was firſt diſſolved without Sunſhine, the Liquor was not above the height of *five* inches and an *half*. Poſſibly it retains ſome part of the Cold a while after the ambient Air becomes more tepid.

So farr Dr. Beale. *What Dr.* Wallis *was pleaſed to impart on this Subject, was written* January 7. $17\frac{69}{70}$, *at* Oxford, *as follows.*

Concerning my Thermoſcope and Baroſcope (the former of which is known to give accompt of the Temper of the Air, as to *Heat* and *Cold*; the other, of its *Weight*;) I have ſome few particulars to add to the Obſervations, I ſent you ſome years agoe.

The *firſt* is, that, whereas I did then obſerve, that in Hot weather the Quick-ſilver in the Baroſcope did uſe to riſe obſervably, eſpecially in Sun-ſhine and the Heat of the day; which might *ſeem* to argue the Air to be thereby made heavier, (which *I* find was the caſe of ſome other Baroſcopes as well as of mine, and put us to ſome thoughts concerning the reaſon of it;) I do now find (having kept the ſame Barometer, for the ſpace of five years, unalter'd,) the caſe, for theſe two years laſt paſt, to be ſomewhat otherwiſe: And that in hot Sun-ſhiny weather the Quick-ſilver doth rather ſubſide a little; and in extreme Cold and Froſty weather it riſeth.

Which maketh me Judge the Cauſe of theſe contrary Obſervations to be this, *viz.* That the Quick-ſilver, at its firſt putting into the Tube or Baroſcope, was not ſo perfectly cleans'd from Air, but that ſome ſmall quantity of it did remain, undiſcern'd, in the Quick-ſilver: Which latent particles of Air, though ſo ſmall as not to be at all diſcernable to the eye by bubbles, yet by the external heat (adding new ſtrength, as it uſeth to do, to its Elaſtick or Springy power) were ſo much expanded as to give ſomewhat a greater bulk to the ſame quantity of Quick-ſilver, with which it was mingled, and conſequently to make it riſe ſomewhat higher, as being *ſpecifically* lighter (that is, having the ſame weight in a larger dimenſion, or, in the ſame dimenſions, a leſſer weight;) and, upon the receſs of the external heat, the Spring again ſlackening, the Air, being more compreſs'd, ſuffer'd the Quick-ſilver to be again contracted into its former leſſer Dimenſions, and ſo to become heavier, and not to riſe ſo high as before, when it was hotter. But now, the Quick-ſilver, having continued in the Tube for five years and upwards, hath by its own weight cleanſed it ſelf better from that little Air that was in it; and that Air, freed from its entanglement with the Quick-ſilver, being got up into the void part of the Tube above the Quick-ſilver, doth act contrary-wiſe, that is, when it is by Heat (upon the ſtrengthening of its Spring) expanded, it preſſeth down-ward upon the Quick-ſilver, and doth a little depreſs it; and, on the contrary, when by Froſt or very Cold weather this Air (by the abatement of its Spring) is contracted, the Quick-ſilver, freed from that preſſure, riſeth a little. But the Riſing and Sinking on this accompt, (as well that formerly, when this Air was in the Quick-ſilver, as that now, when it is gotten above it,) is not very conſiderable; hardly exceeding the twelfth part of an inch, or thereabout.

This Accompt I thought not amiſs to give you, becauſe it may poſſibly keep your ſelf, or ſome others who make uſe of Baroſcopes, from being impos'd upon by ſuch Obſervations; as if the Sun-ſhining or Heat of the weather did make the Air heavier than before; whereas it ſeems to be but an *accidental* operation upon that un-obſerv'd Air latent in the Quick-ſilver. And I thought it the more neceſſary to take notice of it, becauſe it is not ſo eaſily diſcover'd, unleſs by keeping the Baroſcope unalter'd for a longer time, than (perhaps) is done by ſome of thoſe, who make uſe of it; and, without which, I had not diſcern'd it my ſelf.

On this occaſion, I ſhall add another Accident, which I lately took notice of. Obſerving in the late hard Froſt, that the Quick-ſilver did not riſe a little, at ſuch time as, by reaſon of the fierce freezing, *I* expected it might; I did ſuſpect (as it prov'd to be,) that a little drop of water, (which was at firſt made uſe of for the cleanſing of the Quick-ſilver from the Air, and which hath ever ſince remain'd on the top of the Quick-ſilver within the Tube,) was frozen faſt to the glaſs, ſo as to ſtop the Quick-ſilver from aſcending: And, to try, whether it were ſo or no, I did a little ſhake the Tube by moving it up and down, ſo as to make the Quick-ſilver undulate. Whereupon I found the frozen drop of Water to keep its place, while the undulating Quick-ſilver did ſeveral times beat againſt it. And,

(which

(which is the thing, for which I mention it) the Noiſe upon theſe knocks was not ſuch a dull noiſe, as Quick-ſilver or other Liquids uſe to make in the open Air, by daſhing againſt Glaſs or Ice, or other ſuch hard Bodies; but ſuch a hard ſmart noiſe, as hard Metals uſe to make by knocking one againſt the other; or, as if this Ice had been ſo knock'd by a ſolid piece of Iron or other Metal of ſuch a bigneſs. Which difference of noiſe from what would have been in the open Air (where the intermediate air muſt firſt have been beat away, before the Quick-ſilver could ſtrike the Ice, and thereby the ſtroke of the liquid body obtunded or broken,) I attribute to that voidneſs of Air, which was between the Ice and the diſtant Quick-ſilver. And I remembred preſently, that the Honourable Mr. *Boyle* had formerly ſhew'd me an Experiment, very like this, upon another occaſion: which made me the readier to take notice of this; and I did it ſeveral dayes ſucceſſively. But when, by applying the heat of a Candle to the ſide of the Glaſs, I had melted this Ice, I found (as I expected) that within a little time the Quick-ſilver was riſen about a ſixteenth part of an Inch above what it was before; which the freezing of the Water had till then hindred it from doing.

My Thermoſcope, or Sealed Weather-glaſs, (which, having no communication with the Open Air, and ſo not being affected with its Weight, gives accompt but of its Heat and Cold;) hath, this laſt Froſt, been much lower than I ever have known it, upon *five* years conſtant Obſervation. Which proceedeth partly from the Extremity of the Cold, more than ordinary; and partly from the incloſed Liquor (being Spirit of Wine, tinged with *Cochineal*,) growing leſs ſpirituous.

It was firſt made in *Decemb.* 1664. In the Months of *January*, and of *February* following, we had very ſmart froſts, more cold than ordinary; when yet the loweſt mark, to which the liquor did ſubſide (in very hard froſts, and very cold wind,) was at inches $12\frac{1}{4}$: (at which time, $14\frac{3}{4}$ was froſt certain, and ſometimes at 15 and at $15\frac{1}{2}$:) The hight in Summer following, 1665, was uſually at 20, 21, 22, or thereabout; but in ſome few very hot dayes, at 25, 26, $26\frac{1}{2}$; (the whole height of the ſmal Cylindrick glaſs, whoſe cavity was about $\frac{1}{8}$ of an inch diameter, being about 28. inches; beſides a ſmall Spherical bowl at the top, of about $\frac{3}{4}$ of an inch diameter; and a bowl at the bottom, which contained the liquor, of about 2 inches diameter: the ſpace above the liquor being, at the firſt compoſure of it, voyd of Air, ſave what it had out of the liquor, which, being warm at the firſt putting in, fill'd the whole cavity, while the Glaſs was hermetically ſealed.)

The Winter following, the liquor ſeem'd to remain much about the ſame temper as in the next foregoing. For in *December*, *January*, and *February*, we had at $14\frac{1}{2}$ Froſt certain; ſometimes at 15. or higher; and the loweſt, to which it did that winter deſcend, was 12 $\frac{3}{4}$. The height, in the following Summer, *1666*. was uſually about 19, 20, 21; the higheſt of all, at 25.

About the end of *December* 1666, and the beginning of *January* following, it was, in hard froſty weather, at 12, 11, and once at 10 $\frac{1}{2}$, the weather being very cold, and the liquor (it ſhould ſeem) becoming ſome-what leſs ſpirituous, having evaporated ſome of its more ſubtil parts into the voyd cavity: and it was Froſt certain, that winter, about $13\frac{1}{2}$, (an inch lower than the years before;) ſome-times at 14, or $14\frac{1}{2}$. The uſual height in Summer following, 1667, was about 19, 20, 21, and the higheſt at $24\frac{1}{2}$.

The Winter following; it was ſcarce certain froſt at 13; but yet ſometimes at 14, or a little higher: the loweſt, to which it did deſcend that winter, (being very mild after Chriſt-maſs,) was at 12. And the following Summer, 1668, uſually about 18, 19, 20; the higheſt of all (the heat of that Summer being but very moderate,) at 22.

The next Winter it was froſt certain, about $12\frac{1}{2}$; but ſometimes, at 13. or higher: the loweſt of all, at $10\frac{1}{4}$. And in the Summer following, 1669, the higheſt of all (being but a cool Summer) not much above 20.

But now this Chriſtmas, 1669, though I find it to be froſt certain, about $12\frac{1}{4}$, and ſometimes at higher than 13; yet hath it come ſome-times lower than 8; and particularly *Decemb.* 26.

in the morning, to $7\frac{3}{4}$, and did not all that day come ſo high as 8. inches. Which being ſo much lower, than ever it had been in any of the precedent years of my obſervation, though it may in part be attributed to the diſ-ſpiriting of the liquor, yet principally to the extremity of the Cold.

It hath ever ſince been riſing, (but with ſome deſcent in the night-time,) and was on *January* 1, when the froſt ſeem'd firſt to relent, ſomewhat higher than 9; and is this day, Januar. 7, about $13\frac{1}{2}$. The Baroſcope at 29; but for ſome days before, it was about $28\frac{3}{4}$, (the weather having been windy and rainy;) and ſo it was in the froſt, about *Decemb.* 25, but then continued to riſe till about *Januar.* 2. to $29\frac{3}{8}$; but had been *Decemb.* 13. at $30\frac{1}{8}$; which is the higheſt, I have ever known it in my Baroſcope; $27\frac{7}{8}$ being the loweſt, that I have ever obſerved it in, (Octob. 26. 1665;) the moſt uſual hight being about 29, or ſomewhat higher.

But, though mine have been very rarely, and but very little, above 30, or lower than 28, (reckoning from the ſurface of the ſtagnant Quickſilver;) Yet in other places (according to the difference of Airs) it may by others have been found either higher or lower: and ſo likewiſe, according as the Quick-ſilver, at the firſt filling of the inverted Tube, was more or leſs cleanſed of Air. For, a very little Air, left in the Quick-ſilver, and undiſcernable to the Eye, will, when it gets free of it, and remains in the voyd ſpace above the Quick-ſilver, ſenſibly depreſs the Quick-ſilver: And in the mean time, (before it ſo gets free) will, upon heat of weather, make it ſwell.

An Accompt of a ſmall Tract, entituled, *THOMÆ HOBBES Quadratura Circuli, Cubatio Sphæræ, Duplicatio Cubi,* (ſecundò Edita,) *Denuò Refutata, Auth. JOH. WALLIS, S. T. D. Geom. Prof. Saviliano. Oxoniæ,* 1669.

SInce Mr. *Hobbs* thought himſelf obliged to make ſome Reply to Dr *Wallis's* confutation of what he had, not long ſince, publiſh't upon this Argument; Dr. *Wallis* made no ſtay at all to return this Anſwer and ſecond refutation. Concerning which we ſhall give you a brief account, ſuggeſted by Dr. *Wallis* himſelf, of Mr. *Hobbes's* fundamental miſtake in his late Quadrature of the Circle, referring the Reader to the Tract itſelf for the *Figure*, which is therein the firſt.

Mr. *Hobbs*, conſidering, That, in caſe it ſhould *happen* ſo luckily (which was not neceſſary) *that* Q Y (the baſe of a right-angled Triangle Q Y A equal to the Sector L C A, and conſequently the Square Q R S T equal to the Circle B C D E,) ſhould, by the Arch C L, *be cut juſt in the midſt at* P; *then would, not only* (which to his purpoſe was neceſſary) Q P L, C P Y, *be equal each to other* (becauſe of A L P Y common both to the Triangle and the Sector;) *but more-over* (which was not neceſſary) *each of them equal to the half of* P A V, (ſuppoſing C A V taken equal, by conſtruction, to L A P:) all which is true, in caſe of ſuch a lucky hap:

And finding then (which is true alſo) *that this could not All happen, unleſs that interſection at* P, *were in the line* A O (drawn from the Center A to the middle of C G,) becauſe this muſt needs paſs through the middle of Q Y.

Concluded, *That it muſt needs ſo happen, or elſe it was impoſſible for Any right-angled Triangle, as* Q Y A (like to, and part of G C A,) *to be equal to the Sector* L C A: becauſe, *in any other, as* q y A *the interſection of* C L *and* q y *at* p, *would not be juſt in the midſt of* q y; *and therefore* (which he ſuppoſ'd neceſſary, but was not) q p A *not juſt the halfe of* q y A.

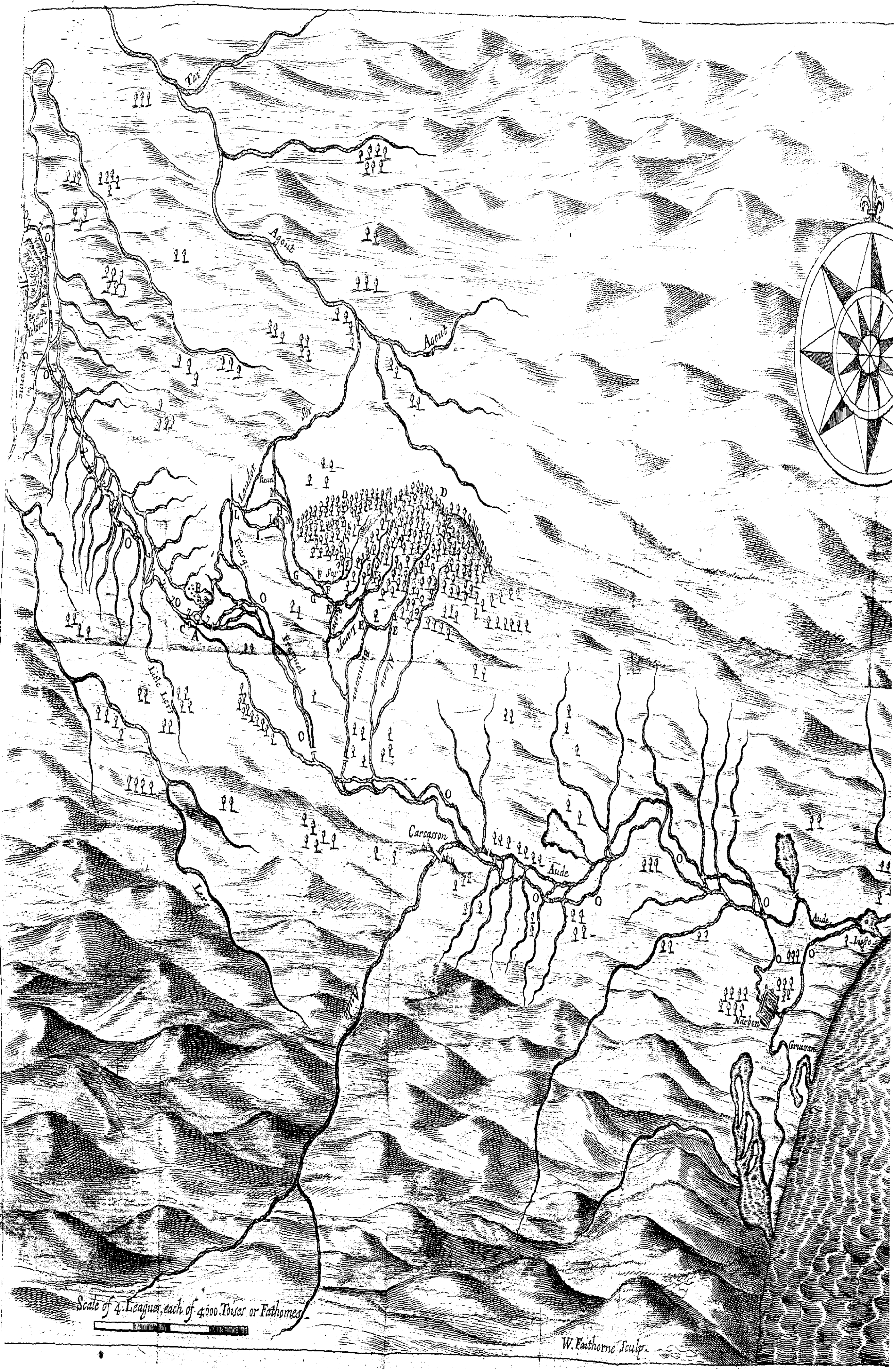
Not conſidering (which is his fundamental miſtake) that, if q p L *and* C p y *be equal each to other* (though neither of them be equal to the halfe of P A V, or of p A v; nor yet q p equal to the halfe of q y, nor q p A to the halfe of q y A; (*the Triangle* q y A *will be equal to the Sector* L C A (becauſe A L p y is common to both;) *and like to the Triangle* G C A, *and a part of it*; which he thought to have been impoſſible.

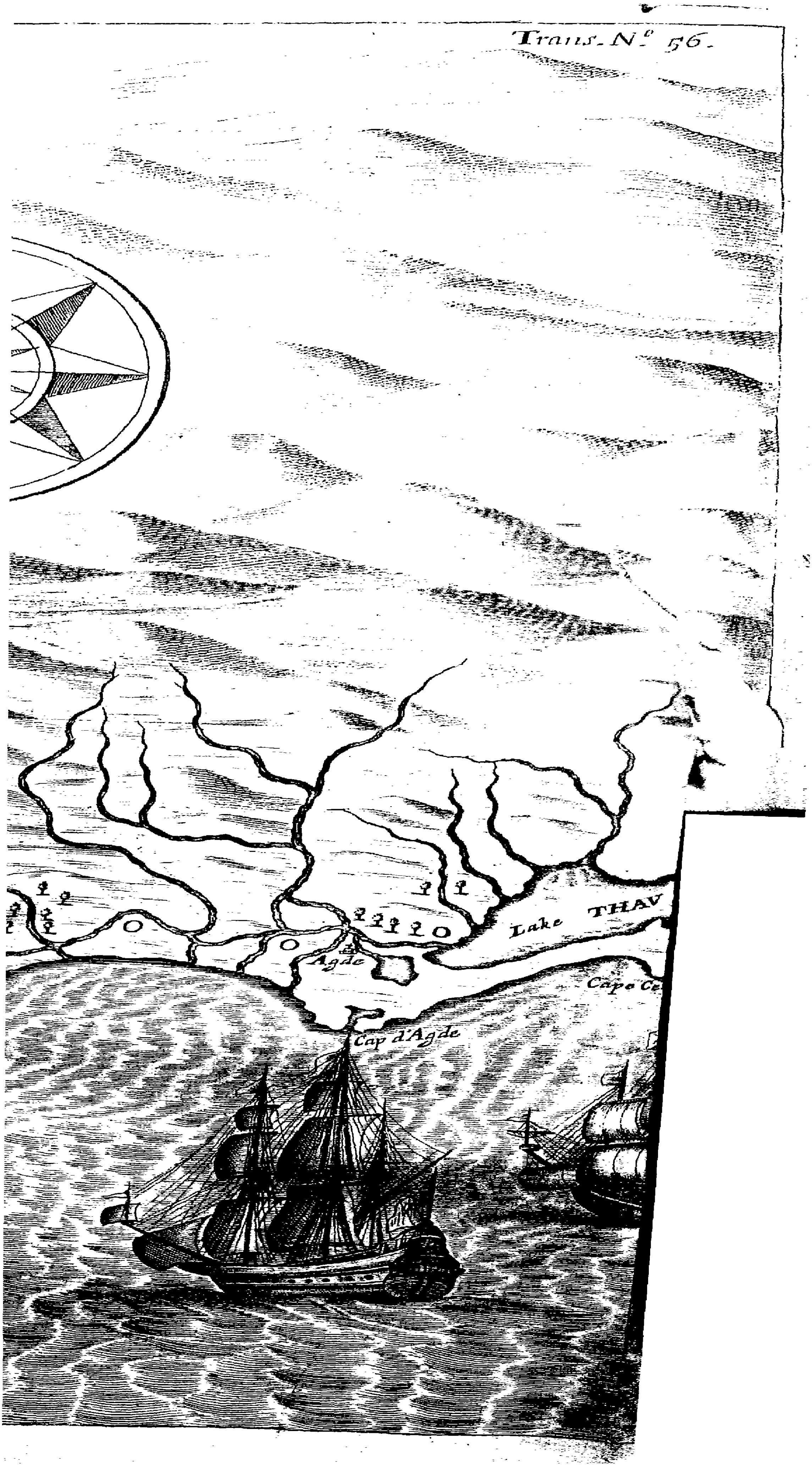
Note

WHat in N°. 54. p. 1077. in the *Anſw. to Qu.* 1. is ſaid of the Obſervation of *Briners*, is to be underſtood, that the Workmen *think* ſo, that they make more Salt with the ſame quantity of brine, at the Ful Moon, then at other times, though really they do not, as the Anſwerer Judgeth by his *Obſerv.* in N°. 53 p. 1064: Who hath ſince advertis'd, that 'tis poſſible at times, when the Pit hath been much drawn firſt, that then, if without intermiſſion they go on *walling* till the *Full*, they may make at that time more Salt, than at another time, it being well known, that much drawing the Pit, ſtrengthens the Brine.

LONDON

Printed by *T. N.* for *John Martyn*, Printer to the *Royal Society*,
and are to be ſold at the *Bell* a little without *Temple-*
Bar, 1670.


Tar
Agout
Agout
Tolouse
Garonne
Sor
Laudot
Reuel
Fresq.
Fresquel
Lamp.
Alzau
Littl. Lers
Lers
Carcasson
Aude
Aude
Narbon
Grussan
Lagse
Scale of 4 Leagues, each of 4000 Toises or Fathomes
W. Faithorne Sculp.


Trans. N° 56.
Lake THAV
Agde
Cape Ce
Cap d'Agde

Numb. 56.

PHILOSOPHICAL TRANSACTIONS.

Februar. 17. 16$\frac{69}{70}$.

The Contents.

A Narrative of the Conjunction of the Ocean *and the* Mediterranean, *by a Channel, in* France, *Some Conſiderations concerning the* Scarborough-Spaw, *together with a ſhort Accompt of a Salt-Spring in* Somerſetſhire; *and of a Medical Spring in* Dorſetſhire. *The Cauſes of Mineral Springs further inquired into; and the ſtrange and ſecret Changes of Liquors examined. Inſtances, Hints, and Applications, relating to a main point ſollicited in the* Preface *to this 5th Year, concerning the Uſe, that may be made of Vaults, deep Wells, and Cold Conſervatories.*

A Narrative

Of the Conjunction of the two Seas, the Ocean *and the* Mediterranean, *by a Channel, cut out through* Languedoc *in* France, *by the Authority of the Moſt Chriſtian King* LOUYS *XIV, and the Contrivance and Management of Monſieur* Riquet: *Engliſhed by the Publiſher out of the* French, *lately ſent to the ſame from* Paris, *together with the printed Mapp of the ſaid Channel, here contracted, and explained.*

IT is not now, that the Conjunction or Communication of the Seas hath been thought poſſible. It hath been always agreed upon, that it was ſo, and *that* many ways, even within the bounds of *France*, without any dependance on or participation with the neighbouring Countrys thereof. The thing hath alſo been often propoſed under the Reignes of *Henry* IV. and *Louys* XIII. of moſt Glorious memory. But whether it be, that it hath ever been Judged too difficult or too expence-full, or that thoſe Great Princes were engaged in more urgent affaires, or that their Miniſters would not apply themſelves to it in good earneſt; ſo it is, that it hath been hitherto rejected, and as 'twere reſerved for the Glory of our preſent Great Monarch LOUYS XIV.

Monſieur *Riquet*, who long ſince had conſidered the thing by himſelf, having open'd it to the Lord *Colbert*, was happy enough to make him reliſh it, by ſhewing him the Advantages, which then might accrue to the Kingdom by facilitating Commerce, and by declaring to him the Difficulties, to be grapled with in this work, together with the Means of ſurmounting the ſame. This Great Miniſter, who inceſſantly watcheth for the Glory of the King, and the *Intereſts* of the State, and lets no occaſions eſcape of procuring them, ſoon acquainted his Majeſty therewith, who having a high concern for what may render his Kingdom happy and floriſhing, gladly hearkened to him, put the thing in deliberation, and having reſolved for it, gave a General Commiſſion to M. *Riquet*, eſteemed by his *Majeſty* the moſt capable Perſon for executing ſuch a deſign.

This difficulty being overcome, and M. *Riquet* having ſatisfied the Objections, made by ſeveral ſorts of people againſt this Enterpriſe, it was neceſſary, before the actual undertaking of the Work, to reſolve upon the Choyce, that was to be made of the two Ways, by which the Channel was to be carryed from the River *Garrone* to the *Aude*. Some of the Intereſs'd would have it carryed all along to the Plains, reaching from *Carcaſſone* to *Tholoſe*. Others would have it run into the river *Freſqueil*, from thence into the Plain of *Revel*, and thence into the river *Agout*, and ſo into the *Garonne*. M. *Riquet* follow'd neither of thoſe two Ways, but form'd thence a third which was; To make uſe of what was beſt in theſe two Ways, by taking from the former, what it had of good convenient Country from the *Point* of *Separation* (deſcribed below) to *Tholoſe*; and from the latter, what advantage the bed of *Freſqueil* would afford him; yet ſo, that whereas ſome pretended to make this Channel of Communication paſs into the very Channels of the little rivers *Lers*, *Freſqueil*, *Aude*; Monſieur *Riquet* maketh his Channel paſs, as much as he can, in the adjacent Plains, leaving the ancient Channels of thoſe Rivers to ſerve for receiving and carrying away the great and frequent inundations of waters, and thereby ſecuring the new Channel from the danger of being inconvenienced by them.

The higheſt place of the whole Channel was well enough known, which was to be the Point, call'd the *Point* of *Diviſion* or Separation. Nature herſelf ſufficiently pointed at it by the *Spring* of *Grave*, which partly runs towards the Ocean, and partly towards the Mediterranean: and 'tis near this place, where the great *Baſon* is made to receive the waters, that are to run both ſides of the Channel. But this water being not near ſufficient, it was neceſſary to find out others, that might be high enough to fall into the ſaid *Baſon*, and abounding enough to keep it always full, and to furniſh for the *Sluces* of thoſe two parts of the great Channel.

It appear'd alſo, that this plenty of waters could not be had but from the *Black Mountain*, diſtant enough from it; but it did nor appear, how this could be effected. In ſhort, 'tis this wherein the greateſt difficulty of the whole work did conſiſt. For we muſt know, that there are many Springs iſſuing from the higher part of that Mountain, and that among the reſt there are Five great ones, which make as many ſmall rivers, that are never dryed up and run along the hillocks of this Mountain, and fall together into the river *Freſquil*; but ſo far above the ſaid *Point* of *Separation*, that that remoteneſs would render them abſolutely uſeleſs, it not being poſſible to make them re-mount. Wherefore to make them ſerve for this purpoſe, it was neceſſary to interrupt their natural courſe from *North to South*, and to give them a contrary one, from *Eaſt* to *Weſt*, by digging a Conduit for them croſs the Mountain, through places, which are all ſteep rocks and horrid precipices. There was then a neceſſity to make thoſe *five* rivers run, the firſt into the ſecond, and the ſecond into the third, fourth and fifth, and to re-unite them all in the *Deriving Channel*, which at laſt carries them to the *Point* of *Separation* for the end above-mentioned.

As for the particulars of this great Work, the annexed *Mapp* will give farther information of them. In it

A. The Point *of* Separation, *being beneath the Town of* Mont-ferand, *near the high way of* Tholoſe, *below the Stones of* Naurouze. *It is ſo called, becauſe that from this place the waters run naturally, on one ſide, to the Ocean, by the* Garonne, *and on the other, towards the Mediterranean, by the* Aude. *In that place is to be a great* Baſon, *Octogonal Oval-wiſe,* 200 *fathoms long, and* 150. *fath. large; which ſhall be ſurrounded with* 72. *houſes to be raiſed on Arches: Over againſt which there ſhall be built a key for the convenience of thoſe that ſhall dwel there, which is to be very ſpatious, and faced with hewen ſtone. This great Baſon ſhall receive all the waters, which the* Deriving Channel *is to conveigh thither from the* Black Mountain, *to be diſtributed by the Royal Channel to both Seas. In the middle of this Baſon ſhall be a* Coloſſe, *repreſenting the King ſtanding in a Triumphant Charret, drawn by four Sea-horſes, holding one foot upon a Globe, and a Trident in his hand, as marks of his greatneſs both by Sea and Land. And then a ſtreame of water, iſſuing as from a Source under the Charret, ſhall as 'twere be beaten back, and diſgorge itſelf through the throat of Serpents toward the four parts of the World; repreſented by as many Rivers, which ſhall alſo poure out of their urnes a prodigious quantity of water, to ſhew, that the Graces, which the Liberality of the King plentifully diffuſes to all his people, do paſs through the hands of the Lord* Colbert.

B. The Stones *of* Naurouze, *lying on the left hand of the high way of Tholoſe on the ſide of a little hillock.*

C. The Fountain of Grave, *whence the waters run partly to the Ocean, partly to the Mediterranean.*

D. The Black Mountain, *on which there is a great Forreſt, called* Remonde, *ſo pleaſant in Summer, that the Counts of* Tholoſe *did heretofore paſs there that whole ſeaſon in the divertiſement of Hunting. It was from hence, that it was found poſſible to make this Channel, by the means of the Five Rivers and a great number of rivolets, iſſuing thence; without the concourſe whereof it had been impoſſible to undertake it and to render it navigable. It is in this Mountain, a good way under the Mill of* Calz, *on the river* Sor, *where begins the* Channel of Derivation, *which hath its declivities through terrible precipices, where it receives the rivers* Bernaſſone, Lampi, Rietor, Alzau, *and* Lampillon, , *to conveigh them into the Magazine of St.* Feriol, *by the means of an other Conduit, when need ſhall be to fill it. It would be troubleſome to relate all the pains, which this Channel of Derivation, almoſt all cut through rocks, hath coſt; or the number of* Dams, *that were neceſſary to be made athwart many rivers, to divert their natural courſe; or laſtly the Mountains, that were to be levelled, having been counted afore inacceſſible rocks, and affording now agreable walks.*

E. The Channel *of* Derivation, *digged in the Black Mountain, and receiving al its rivers.*

F. The Place, whence the ſaid Channel *diſcharges itſelf into the river* Sor

G. Another Channel *of* Derivation, *conveighing the water of the Black Mount into the Magazin above-mentioned.*

H. The Magazine *of the Water of St.* Feriol. *This Work might be reckoned among the Wonders of the World, both for the Contrivance of its admirable Structure, and for the prodigious quantity of Water, it is to contain. For, it will be above* twelf-hundred *fathoms long*, ſixhundred *large, and* twenty two, *deep; and is to furniſh every minute of an hour, for ſix moneths of the Year, more than eight Cubic feet of water. This vaſt Store-houſe is between* 2. *Mountains, through the middle of which runs the ſmall rivolet* Laudot. *'Tis true, Nature hath done ſomething wonderful, in forming a diſpoſition thereto; but 'tis alſo certain, that Art hath much ſurpaſſed her, by the ſtrong Banks or Dams, which are there rais'd to bear up againſt ſuch a vaſt quantity of water; as alſo by the admirable Aque-ducts, that are to have more than* 80. *fathoms in length, for giving the moſt liberty and facility to the waters to run out, when there ſhall be occaſion; and laſtly,* by *the great Wall, which is* 22. *fathoms high, and* 600. *fathoms long: to ſay nothing of the incredible quantity of Earth, which* 2000. *Woemen daily carry to this wall, thereby to ſtrengthen it on both ſides.*

I. *The natural courſe of the river* Audot, *which by the means of a Channel conveighs the Water of the ſaid Magazin to the Cape of of* Bon Amour, *where it joyns itſelf with thoſe, that come from* Revel *to go to the river* Sor, *to paſs together to the Point of Diviſion.*

L. The Cape *of* Bon Amour, *ſo called by reaſon of the two Channels; where the one, coming from* Revel, *brings the waters, which went to the Ocean, and the other, which comes from the Magazine, brings thoſe of the Black Mountain, that paſs'd towards the Mediterranean.*

M. The Port Louys *near* Revel, *newly built, faced with hewn ſtones of* 20. *fathom ſquare; where the Lord* Bourlemont *Arch-biſhop of* Tholoſe, *and M. de* Bezons, *Intendant of Juſtice in* Languedoc, *accompanied with many of the Nobility, embarqued in* May 1668. *to make an Experiment of this litle Channel, and rowed on to the Stones of* Naurouze, *with that ſucceſs, that M.* Riquet, *having found the advantages, which the neighbouring Towns and Villages might thence receive, beſides that of carrying the waters to the* Point *of* Separation, *did ſo enlarge the ſame, that now it carryes great Boats, though it be on the declivity of an Hill: which cauſeth wonder in all thoſe, that ſee it.*

N. The Channel, that goes from Revel *to the Point of Separation.*

O. The Royal Channel, *which goes from the* Garonne *into the* Lake *of* Thau *or* Frontignan. *It is to be in its narroweſt places* 9. *or* 10 *fathoms broad, and at leaſt* 9. *foot deep, according to the places, where it muſt be more or leſs digged. You may ſee in the annexed* Mapp *a great many rivolets, rivers, and Ponds, which it traverſeth, and which in winter are as many* *torrents, that would cauſe very great inconveniences, if it were not for the care uſed to prevent them. The Boats that ſhall come from the Mediterranean, ſhall enter at the Port St.* Louys, *which is at the* Cape *of* Cette; *and thoſe that ſhall come from the Ocean, ſhall paſs to* Bourdeaux: *they ſhall aſcend by means of Sluces unto the* Point *of* Diviſion, *and deſcend from thence after the like manner. The number of the Sluces will be great, becauſe of the great declivity, there is from the ſaid Point towards both Seas. In the Mapp are noted thoſe only, that are made from* Tholoſe *unto the* Point *of* Separation, *whilſt we are buſy in marking alſo thoſe on the other ſide with the ſame exactneſs.*

7. The mark of the Sluces.

Some Conſiderations

Relating to D. Witties *Defence of* Scarborough Spaw *(abbreviated in* Numb. 51. *) together with a brief Accompt of a leſs conſiderable* Salt-ſpring in *Somerſetſh*; *and of a Medical Spring in* Dorſetſhire; *by the Learned Dr.* Highmore *in a Letter to Dr J.* Beale *at* Yeavil *in* Somerſetſh.

Worthy Sir,

I Give you many thanks for the laſt Letters, and the loane of your Book. The Dr. indeed hath gotten ground of his Adverſary; but whether either of them hath gotten the right on his ſide, I cannot Judge, being a ſtranger to that Water, much differing (it ſeems) from theſe about Us; and therefore may participate of other Minerals, and more, both in quantity and number. But, whether all thoſe diſtinct Minerals, reckon'd up by the Dr, do conſpire to make up this Medicinal water, and that none of them can be left out, may be doubted: And it ſeems, he doth himſelf ſpeak very doubtfully as to Salt; acknowledging it to be the leaſt of all the other, if there be any differing from the Salt of the Metals; though it be ſometimes covered by the Sea, as he ſaith pag. 89.

Next, I wonder, why he ſhould ſet *Allom* in the front of the Conſtituents of his Medicinal water: *Alumen exiccat, aſtringit, incraſſat*. Now how the Water ſhould be ſo highly deopilative, and ſo beneficial to Hypochondriacal and Cachectical perſons, being impregnated with ſo great an Aſtringent, I underſtand not, neither doth the Dr. declare: Beſides, he confeſſeth, Allum-water will not tinge with Galls as he acknowledges *this* will do.

Further, why he ſhould make *Iron* and *Vitriol* two diſtinct Mineral Conſtituents of this Water, and call it *Ferrum Vitriolatum*, I do not ſee: As if Vitriol were a ſtranger to Iron, or that they were here two diſtinct Minerals; when indeed Iron alone will ſupply both. Vitriol is the Salt of Iron, and there is no Iron without it. And that Vitriol, which he ſaith is found alone in the Rocks near this Water, will by the Summer-heat be hardned into Iron, which in a forge will melt and run. So that, though Vitriol may be found alone without the Iron-ſtone, it is not becauſe it is no Ingredient in the Compoſition of Iron, which cannot be Iron without it; but becauſe thoſe Vitriolin Earths are not grown to that perfection, but either by ſome accidental mixture of other Bodies is clapt up into the Compoſition of ſome other Mettal or Mineral; or elſe wants thoſe Bodies, or time, that ſhould fix it into Iron.

And truly that opinion of Learn'd Dr. *Jordan*, that Waters are tinged by Minerals while they are in *fieri* (though it ſeems to ſome ridiculous, as importing, that they ſhould remain for many hundreds of Years in the ſame imperfect ſtate,) may yet have much of truth in it here. And what can the Water receive from a perfectly wrought and mixt Metal, in its paſſage by it? But when the whole maſs is *in ſolutis principiis*, no part fixt by its neighbour, but every one at liberty, the water, paſſing through, may eaſily lick up ſomething of every Body diſſolveable in it. And that theſe Bodies may continue in this State of Liberty for many years, without a *copula* to fix them into ſuch a Metal, is not a matter either un-intelligible or ridiculous. The Salts in the Earth may combine with different Bodies, and make up ſeveral compounded maſſes, which yet, when diſſolved, may communicate the ſame properties. The Vitriol of Copper makes water acid as well as that of Iron.

But it is not my buſineſs to undertake the quarrel; only I muſt note, that his Colouring of Roman Vitriol *pag.* 21 is erroneous. Note, that Vitriol was omitted in the Print of *Numb.* 51. p. 1039. l. 40.

In the 120th pag. he is diſſatisfied, that his Adverſary allows the Saltneſs of the Sea to proceed from the Foſſile Salt; or from ſuch Rocks and Bodies of Salt which are often found in the Sea;

beſides the Saltneſs diſperſed throughout the whole Body of the Earth, eaſily imbibed by water. He will rather allow the *Peripatetical* Torrefaction by the Sun to be the Cauſe; which ſeems very improbable: For, the Suns heat cannot act more powerfully on water to this Effect, than Fire doth; yet this will never give ſaltneſs to water, that is not already impregnated with ſaline particles. And his Argument againſt his Adverſary ſeems not convincing; namely, That it ſhould, if made by Foſſil Salt, kill all Fiſh, as well Sea-fiſh, and Freſh-fiſh; for ſo, *ſaith he*, Salt put to freſh water doth. As the matter of Fact is not evident, that Salt put to freſh-water ſhould kill Sea-fiſh (the contrary of which I have experimented in Oyſters;) ſo it ſeems not probable, that the Salt, which was lately imbodied with the water in the Sea, and was then natural to Fiſh, ſhould, after its ſeparation and reunion again in the like proportion, prove ſo fatal. That the Salt of Sea-water and Salt-ſprings is the ſame with Foſſil Salt, will be no hard matter to ſhew. The Inland Salt-ſprings do receive their Saltnes from this Salt, or from nothing elſe that coms within our imagination. From the Sea it cannot be ſuppoſed to come at ſuch remote diſtances, as we do frequently find it.

Concerning the Salt-ſpring at *Eaſt Chenock* in Somerſetſh. I ſhall tell you, That the laſt week, being at Mr *R*'s. houſe, I made tryal of that Salt-ſpring, above 20. miles from the Sea; which, though not ſo ſalt then (by reaſon of the late Raines) as in Summer, yet from a Wine-quart, by Evaporation, we obtained near 80. grains, part of which I here ſend you. Neither can theſe Springs be ſalt from the Suns Torrefaction, ſince they lye no nearer to the Sun's force than many other Springs about them; which yet continue freſh.

Moreover, if I may gueſs at the Ingredients of thoſe Waters, which we call *Chalybeate*, aud particularly of this at *Farrington* in *Dorſet-ſhire*;* I think them to be impregnated, principally from the Vitriol or Salt of Iron, which is very Volatile; ſo that little of it can be found, by evaporation of a great quantity, or from the precipitated ſediment. The proportion of Salt in this Water I found after this manner. I put 4 ounces of ordinary clear water into a Glaſs,

* *Which is the ſame, that was, by a miſtake, ſaid (in* Numb. 51. p. 1039. l. 2.) *to be at Stalbridge in Somerſetſh.*

and impregnated it with a known proportion of Gall: then by degrees I let fall into it the Salt of Iron, until I found it thereby as deeply tinged red, as the ſame quantity of *Farrington*-waters would be by the ſame proportion of Gall: The quantity of the Salt of Iron, that performed this, was near two grains. This water, ſo tinged, taſted and ſmelt juſt as the natural water from the Spring with Gall did: If I added a greater proportion of Salt, it would make it nauſeous and Emetical. *Sherborn*, Decemb. 17. 1669.

The Cauſes of Mineral Springs further inquired: And the ſtrange and ſecret Changes of Liquors examined; by Dr. J. Beale, *to the Publiſher.*

Sir;

I Am much obliged to my honored Friend Dr H. for his *Analyſis* of Mineral Springs, and his Animadverſions relating to that Argument. I offer no Objection againſt the Note, that ſome Waters do lick up the Salts, before they be perfectly fixt in the Materials of Metals: Only this I humbly propoſe for further Inquiry; Whether ſome Waters, by their long paſſage through ſub-terraneous ſteams of divers kinds, and by heats and coolings, and by many changes of theſe, and by ſeveral kinds of ſtrainings, by colliſions, and manifold alterations of the contexture of their minute parts may not firſt acquire ſome Metallin Tincture; and thence aſſiſt the Generation of Perfect Metals, if they meet with fit materials; Or if they ſhould be further concocted, before they be intercepted by opening the Spring: If this may ſometimes fall out, then we may in ſuch caſes avoid the difficulty of undertaking, that Metals, there continued hundreds of years, are imperfect and in *fieri* And perhaps the *Chalybeat* and other Metalline Spirits may be purer and more throughly deopilative, before they be embodied into firm Metals, than after they are by Fire extracted. And then this may be a ſecret cauſe, why ſome Springs prove effectually Medical, when other Medicins do faile.

Learned *Varro* ſaith, *Tellus Mater omnium.* And we can eaſily apprehend, that all ſolid Bodies, even Gold and firmeſt

Jewels, though they ſeem ſtrong enough to hold out a Platonical Revolution, do nevertheleſs naturally tend to a Terreſtrial Diſſolution. And ſome of the Antient Philoſophers have conceived, that *Water is the Mother* to Earth itſelf, And they ſeem to have the greateſt Authority, as well as good Reaſons on their ſide. And Honourable Mr *Boyle* hath by choice Experiments taught us, that Water may have her turn to put in her claim for a Maternal right; and to be as much a Principle, as any of the other which we call Elements. And it ſeems to hold a kind of Middle Station between Earth and Air; apt to be condenſed into the former or to be expanded into the latter; and to have a nearer allyance to running Metals, ſplendid Gems, and tranſparent Minerals, than Earth can have.

But *Tachenius* in your *Numb.* 50. offers more cloſely, the *Various Salts*, eſpecially of the *Alcaly*'s, and Acids, to be the Principles of all mixt Bodies. I cannot doubt, but that they are generally neceſſary Ingredients and powerful Agents for Generation: And perhaps there are as many kinds of Salts, as there are Earths, Minerals, Stones, Metals, Vegetables, Taſts, &c. from the ſweeteſt Sugar to the moſt diſpatching *Menſtruum*; Yet many of them by their expedit Volatility, and ſome by by their inclination to unite firmly with water, as in Glaſs, do ſhew a more than ordinary congeniality and friendly agreement with the pureſt liquids, Air and Water.

But to decline intricate Theory's, and therewithal the ſubtilties and difficulties of determining, Whether Salt or Water be the nearer or more original Principle; or the more copious, more active, or more influencing in this or that Body: This we have before our eyes; The Birch and Alder feed more kindly on a thin uliginous moiſture, the Elme, Pine, Firr, Pitch, and Cypreſs, chuſe a ſtronger liquor; yet theſe and many more of the wideſt difference, are ſometimes ſeen to draw their whole ſuſtenance, bulk and ornaments, whether annual or perennial, from the liquors they find in the ſame piece of ground, and from the ambient Air, and Dews; when as yet by our beſt diligence we cannot diſtinguiſh the Liquors or Salts cloſely approaching their ſeveral Roots. And we may exchange all the Earth totally from the Roots of Trees, whoſe Barks, Sap, Fruit, and

Seed have very much differing Salts, and are of very different kinds; and yet ſee each Tree proſper the better by the Exchange. Hence we may ſuſpect, that the very contextures of their Bodies, from the firſt ſpirting of their ſeed, and as they are form'd gradually from the Inviſible Principles or Spirit and vigor of their Seeds, however ſmall and imperceptible, are the *natural Limbecs*, where the common Raine, Water, and Air, are digeſted into very much differing Leaves, Fruit, Seed, Reſins, Gums, cooling Julips, &c. perhaps as the Cow's belly converts the common juyce of all ſorts of Graſs into Milk; or as the Bee ferments the dew of all Flowers into Hony and Wax.

We ſee alſo, that an handful of Moſſe, ſometimes above a ſpan long, and reſembling Vegetables, grows out of a ſmall Oyſter-ſhel, without Earth, dirt, or ſand for the relief of the Root; Trees out of bare Rocks, and the annual attire of Harts and Bucks out of their bony Heads. Whence we may eaſily appreend, how the Seeds in their time, and afterwards the Roots, Stems and Leaves of Trees, may be the proper Strainers to generate the peculiar Saps and Juyces; and perhaps to ferment and boyle the Liquors into their ſeveral Salts. It may paſs for a reſemblance, if not for an inſtance, that the Juyce of ſome ſweet Pears may be dryed into a very ſweet Sugar; and the Juyce of ſome other Pears is ſo fierce, that at the very opening of the Rind with the teeth, it doth almoſt ſuffocate, as if it would kill dead immediately; and yet this Juyce by time and ſeaſonable maturation becoms ſweet, winy, and luſcious. And we hear of divers Exotick fruits that will kill outright; and that ſo quick, as may challenge the fierceſt *Menſtruum* of an expert Chymiſt. Now, as the Horns of a Stagg have their whole growth aud vertue from the protruding Bloud and Spirits of the Animal; the Moſſe (as by the Microſcope appears, when withered) from the inward ſhel of the Oyſter and the Marine Water; ſo in Plants, the Sap may by Heats and Coolers, and other changes in Summer, Autumn and Winter, by Winds, and compreſſing Air, be hardened into the Timber, Seeds and their Stones and Kernels. All ſeems to be but Sap at the firſt draught, or little elſe beſides pure Air and Water, till theſe be concreted into peculiar Salts by more curious Strainers, and by more ſubtil Boylers than Art hath hitherto deviſed. And with no leſs probability Mineral Waters may acquire their proper Salts in their ſubterraneous paſſages by their Strainers and Conveyances, by the various Temper they meet with, and by their daſhes, and following changes of contexture. But this I leave to further inquiry.

And this was my Ayme in your Tract 43. p. 855; where by a ſlight and curſory alluſion I compared the Motion of Sap in Vegetables to the deſcent of Liquors in an Alembick. I had no thought of ſquaring the compariſon to agree in all circumſtances. And here alſo I pretend to very little more than alluſions all along. It requires deeper work, a larger compaſs, and a cloſer attention to eſtabliſh a General Theory upon the Intrigues of Vegetation, and of all Saline Operations: The very Air may (for ought I know) afford ſtore and variety of Salt to daſh the Foundations of my Overtures, at leaſt as far as pertains to Vegetables. And the Mineral Salts have their receſſes deeper, than I can dive, and their activities are ſwifter, than I have skil or leiſure to trace.

Neither had I any phancy, that the Sap in Winter deſcended to the Root, ſince I ſaw an Aple-tree, that yielded 4 or 5 Hogſheads of ſtrong Cider yearly; and a Pear-tree, that yielded more Perry; yet both growing on a dry ground, where they could get no other liquor then what the Clouds and the Air afforded: Yet I conceive, that theſe Trees have an intercourſe of peculiar Spirits ſome way linked together, and vigorouſly co-operating, from the very Fibers of the loweſt Roots to the Top-leaves. And of this I had ſome warineſs, when I expreſſed the correſpondence between the Timber and Seeds in theſe terms—*more immediate and peculiar*, Numb. 46. p. 920.

But I have no fondneſs for thoſe Notes, which bear my name in your *Tracts* of N. 43. and 46; They were haſtily dictated, neither reviewed, nor fitted for the publick; otherwiſe I ſhould have promis'd leſs and perhaps prov'd more. If the Impertinences, Incoherences and diſlocations may be pardon'd, I can ask no other favour for thoſe Scribles.

Inſtan-

Inſtances, Hints, and Applications, relating to a main point, ſolicited in the Preface *to this* 4th Vol; *concerning the uſe may be made of Vaults, deep Wells, and Cold Conſervatories, to find out the Cauſe, or to promote the Generation of Salt, Minerals, Metals, Chriſtal; Gems, Stones of divers kinds; and helps to conſerve long; or to haſten Putrefaction, Fertility of any Land, &c. by the ſame D.* Beale, *in another Letter to the Publiſher.*

Sir,

I Shall here collect from your own Tracts, (with a brief touch from my own Obſervations and Readings) a few Hints, pertaining to your Solicitations in your *Preface to* this *4th Vol.* N. 45. pag. 896.

1. Our worthy Friend, Mr *Evelyn*, in his *Sylva*, as it is now moſt excellently improved in his 2^{d} Edition, C. 3. p. 26, reciteth, that a certain Oak was found buried ſomewhere in *Tranſylvania*, near the Salt pits, intirely converted into an hard Salt. He adds, that this Experiment, if true, may poſſibly encourage ſome other attempts for the multiplying of Salt. *Thus he.* And hence I hope, I may be excuſed for my Inquiſitiveneſs after Salt-ſprings; which however weak, may poſſibly ſometimes Indicate more Foſſile Salt than is drayned or approached by that particular Spring. And Sr. *Hugh Plat* in the beſt Cabinet of his *Jewel houſe* c. 104. rebukes our lazy Engliſh for neglecting the rich and fertilizing Quality of our Brine, which encompaſſeth our Iland, and meets us at the foot of ſome of our Hills. Some indeed in the *Weſt* do make uſe of brackiſh ſand, and do find a good reward when they bear the charges of carrying it far, for the enriching of their Inheritances; whilſt other Ruſticks will not be intreated to accept of the Brine they have in the midſt of their own Grounds. Certainly the Saline ſteams are carryed by the Air and Wind much farther from Salt itſelf in heaps, or veſſels, than from the Sea water: From whence the Dews, which ariſe in vapours, do deſcend as ſweet and pure as the Dew which aſcends from the Earth; and the Rain ſhews no difference. And I gave you

once an Experimental proof, that either the Saline *Steams*, which aſcend from a heap of Salt, do pierce through very thick ſtone-walls; Or (which I did much rather conceive,) they generate more Salt, to a great depth of thickneſs, in the Lime and Mortar of the *Walls*.

2 Dr *Power* in his *Microſc. Obſ. pag. 62.* aſſures from good Teſtimony, and common experience, that a Mineral heat in the Subterraneous parts produceth Minerals: And particularly, that in Allum and Coperas-mines, thoſe Minerals being broken, expoſed, and moiſtened, will gather an actual heat; and produce much more of theſe Minerals, than elſe the Mine would yield. And there he further proves by an unlucky accident, that Braſſe-lumps, (which he ſaith is a kind of Marcaſite,) being layd in heaps and expoſed to the moiſt Air, or ſprinkled with water, will ſmoak, and grow exceeding hot; and ſometimes take fire, and burn all that is about them. *Thus he.* And all ſorts of Dung afford a Heate, ſome leſs, and ſome ſtronger; ſome ſpeedily, and ſome more permanently. And ſtore of Nitre may be had from the ſweepings of the houſe, any kind of aſhes, ſhoveilings of any ſordid place, the cleanſings from the back ſtayrs, and emptying of the Chamber-pots, if always caſt as *ſtratum ſuper ſtratum* in a dry Well, or Vault, only ſo covered and fenced, that the Rain and water gets not in. Dr *Power* ſhews here, How Metals or Minerals may be generated; but how far this Generative force will run, and from what Bulke of Materials; and what Materials are apteſt to be transformed into what Minerals or Metals, we muſt refer to further tryal. Of this we are certain, that by a ſtrong Fire, thus raiſed by Braſs-lumps, Stones and Metals may be vitrified, and thence aſſume another Nature, and Luſtre than is ordinary; And by the Gentler heats, (beſides the acqueſt of Salt-peter in the end) there may be Mechanical applications peculiar for the Gradual and ſlow productions of Chymiſtry, both for natural effects upon uſual Proximities, and for Artificial Contrivances.

3. In your *Num. 6.* p. 101, you ſhew us, that there a is place in *England*, where, without petrifying water, wood is turned into ſtone, in a Sandy Earth. But can we yet ſay, whether Vaults digged in ſuch Grounds may not have a Petrifying *Spirit*, as

there is a faint and ſlow Petrifying Spirit in *Ookey* Rock near *Wells*, and, as I hear, in ſome other Rocky Vaults in *England*, and elſewhere? Or do we yet know, what will more eaſily and ſpeedily, and what more difficultly, be turned into a Stone? Or what the differing effects may be from the ſeveral kinds of Materials? Whether Bones, or Horns, or *Album Græcum*, &c. may not here be turned into *Oſtea-Colla*; or to a better Improvement? And they, that have the command of Petrifying waters, may make ſuch and many other tryals for conſiderable Diſcoveries in Philoſophy. I know a Rock in *England*, which hath a Hole ſo deep, that the Neighbours do report and generally believe, that it is bottomleſs; And a ſtone may be heard to daſh from ſide to ſide a pretty long time. Some Philoſophical uſes may be made of ſuch deep holes. And the ground, which bears the fair ſtones, called *Aſtroites*, about *Belvoir-Caſtle* in *Lincoln-ſhire*, and that which bears the little Diamonds near *Briſtol*, and where the ſtones of peculiar figures, as of *Helmets*, *Scalops*, *Cockles*, &c. are found frequent on the ſurface, digg'd up in heaps, in ſuch places the ground may be tryed, both rayſed in Hillocks and ſunk into Vaults.

4. I have by experience found, that there are ſome Vaults of no great depth, not at moſt above 4 or 5 feet, that will ſpeedily diſſolve ſtones, and releaſe from the ſtony Ligature. Of this I reſerve for you a further accompt; For I am already tedious, and this would involve into many Circumſtances hardly Credible; whereof one is this, that being expoſed to ſome aſſaults from the keeneſt Northwinds, it never yielded to the freezing of any thing placed there in the hardeſt Froſts of this year, or of the years 1663 and 1665: as if the Petrifying *Spirit* had ſome affinity with a long laſting Infrigidation, ſince that which unfoldeth the Petrifying Ligature, by the ſame property reſiſteth Froſt alſo. *So* one would imagine: But by common Experience we know, that Froſts with *Snow* and Rain will diſſolve many kinds of ſtone; and a very rich Marle, which for one, two, and ſometimes more winters holds out againſt all weather, and looks all over very like greety ſtone. Chalk is a pregnant Compoſt for ſome Lands; the Froſt and *Snow* will diſſolve it, and make it run into good manure, when the *Summer*-heat with all the *Summer*-rain cannot diſſolve it.

5. You offer ſomething that may pertain to this purpoſe in your Tract of N. 49. p. 982. concerning the Generation of Chriſtal. And I think, I could ſhew, by a train or liſt of proofs, a ſtrong probability, that, as Heat vitrifies, ſo Durable Froſts, with ſome Concomitants of like nature, by ſome alternative oppoſitions of Heate, or perhaps by coincidence of extreams, do Chryſtallize, or more firmly Petrify the moiſture or ſweat of Rocks and Quarries. The petrifying ſpirit criſpeth by an acuter angle into a firmer ſolidity, than can be performed by any Froſts to us known. And the Marcaſite is formed by a conſtipation ſtronger than that which petrifyeth; and ſometimes, where Marcaſites are generated, there are found alſo ſome parcels of very pure, firm, and ponderous Copper, which requir'd a ſtronger Compreſſion, as by an acuter Angle, for the Generation of the Copper, then for the Generation of the Marcaſite is neceſſary.

6. And that Froſts alſo alter the Nature of Liquors, we had now ſome experience in this ſnowy ſeaſon: For we ſaw the water of diſſolved *Snow* perform a quick cure, in taking out the fire, when the fleſh was burnt by a warming pan of Braſs; which Metal commonly makes the burning more difficult to be cured: Which did put me in mind, to examine the figures of the *Snow*, which now fell in this extreame Froſt. I expected, that we might ſee through the ſmall particles, at leaſt as through Lice, Fleas, Cheeſe-mites, &c. by ſome kind of tranſparence; but I was deceived: My aſſiſtants could make nothing of it, either by an ordinary or extraordinary Microſcope. I was invited to the Inquiry by your N. 39. p. 774. reporting, that in *Germany*, March 1666, or about that time, *Snow* fell there, having the ſhape of Pillars, ſome Tetragonal, and ſome Hexagonal, with a neat Baſis, and a larger head, as in Columns. Perhaps a more skilful ſearch by the beſt Microſcopes may diſcover, either in what ſhape the Rorid particles are, when they are frozen into *Snow*, or into what figures or Angles the particles of the *Snow* are compreſſed by Froſts. If the Clouds were continued and intire body of water, they could not quite hinder the ſight of the *Sun* and *Stars*; for a good depth of clear water will not hinder it: but the particles, being divided in the

Clouds,it muſt needs hide the Sun from us; as ſuch a depth of *foame* and Snow would do. But in this *Paragraph* I would hint the change, and beneficiall Improvement, that may be made upon ſome Liquors by meer Froſts, by Chryſtallizing, and perhaps more by Petrifying Vaults.

7. I obſerv'd a Spring, that in all the extreame Froſts, that have been theſe ten years, hath yielded a ſmall ſtream, which running over a large Tract of Paſture, keeps all the bankes and borders Green, and free from freezing, diſſolving the Snow, and ſmoaking all the way where it runs. And this warming force it holds for 4 or 5 foot on each ſide, wherever it runs, till the very ſmall ſtream falls into a little Chanel. Hence I would offer, that ſome better uſe may be made of ſuch ſtreams for Hortulan Entertainments, and for many Philoſophical uſes, if well conſidered. The Sober Water-drinkers, who are addicted to cleanlineſs, and a ſimple Diet, may by the ſmel and taſt diſcover, and fore-warn of the great Diverſities of waters; which are more or leſs Petrifying, and which more powerfully diſſolving petrification; which aſſiſts Nutrition, and which is more Jejune. Yea perhaps by Aſſiduity and Inſtructions they may Indicate by Springs, and the ſteams of Vaults, much of the Treaſures of our Hills and Mountains; and of all the Subterraneous World. We trayn up Setting-Dogs to find Partriges, but we neglect the Ayd, that may be had from Inquiſitive men for the finding out of Springs for Bolus's, Salts, Minerals, Stones, and Metals; For Health, Accommodations, Ornaments, and wealth. You ſee here, how by Vaults and deep Wells, furniſhed with proper Materials, and ſo covered, that by apertures wider, and ſmaller at pleaſure, we may find the effects of Air in the entrance, and by the rebounding returns, and by mixtures with Subterraneous Steams many effects, which will hardly appear by any contrivance of the *Pneumatic* Engine: As to try, what the Mineral ſteams of all kinds will operate upon all ſorts of Materials, when they are ſtrained by the driving and rebounding Air through ſtrait ~~and~~ [illegible] winding Orifices of various ſhapes, wider and narrower? Whether the Barkes or Timber of Trees are more apt to receive the Saline or other ſteams? And whether the common Saline ſteams may not be appropriated to o-

ther vertues by the ſeveral kinds of Barks &c? The *Tanners* know, that the Bark of ſome Trees hath much more Salt than the Timber: And generally where the Barks have the ſtronger or finer reliſh or Vertue, the Wood hath very little. The wood of the *Cinamond*-tree is Inſipid; And the wood of *Guaiacum* hath not halfe that vertue which the Bark hath. But in theſe trials we ſhould take heed of a danger from the compreſſed ſteams. And if we would uſe a deep and dry Well, for ſtrong heate by Marcaſites, or otherwiſe, we ſhould remember Mr *Boyle*'s proofs of the Incredible weight of the Air, and provide very ſtrong Arches and thick Planks for the Coverture, before we adventure to ſtop in the Air, when it is highly rarifyed by ſuch heates.

8. But that which chiefly encouraged me to give you theſe remarkes of the operations of Froſts and Cold, is this. It growes in faſhion to make *Conſervatories* for *Snow* and *Ice*; and Mr *Boyle* hath layd ſuch deep Foundations to find out the Nature, propertyes, and effects of Cold and Froſts, that we may almoſt hope, that by this branch of Philoſophy, when it ſhall be as carefully Cultivated, as Chymiſtry now is, we may perform as much, if not more and ſtranger things than are yet done by Fire. I do often ask Gardeners, and skilful Husbandmen, whether all ſorts of Land are more fertiliz'd, or more ſpeedily, by the ſolar Influence in our Climate, or by Froſts. For theſe two are the two buſy hands, which manure all kinds of Earth and Water into grateful pregnancy, as *Virgil* of Old,

Illa ſeges demùm votis reſpondet avari
Agricolæ, bis quæ ſolem, bis frigora ſenſit. 1 *Georg*. v. 47.

And they generally affirm, that Froſt and Snow make the quicker diſpatch amongſt us, and the more general and richer Fertility. And, that ſome Diſtillations may be made by Froſts, I have this proof: At my requeſt you were pleaſ'd to get me a Thermometer of a very ſmal and ſlender Stem, eſpecially the higher parts for 10 Inches near the head: All that ſee it, do wonder how ſuch a ſlender Glaſs could be ſafely conveighed hither The Spirit of wine is very deeply tinged, which renders it in that ſmalneſs clearly viſible: I expoſed it out of Doors in the hardeſt Froſts of the extreme winter *Anno* 1665. when the winds were alſo violently ſharpe. In thoſe Froſts there aſcended into the top of the Glaſs ſmall drops like a Dew, which afterwards in time deſcended into the ſtem, and filled up the ſpace of an Inch or thereabouts, and it was as clear, and bright, and more flickering, than any Chryſtal, or Glaſs. On the contrary, in the heat of the Summer I placed a ſtronger Thermometer of ſlow Motion on a Sunny wall, till a part of the Liquor aſcended into the top, and there continued ſome hours: Then by ſloping the Glaſs I divided it from the reſt at a little diſtance. And this took up two inches in the ſtem, being at firſt of a very pale reddiſhneſs. I gueſs it contained much of the Spirit of Vrine, which at firſt was intermingled with the Spirit of Wine; but in a ſhort time all the reddiſhneſs was quite conſumed: And ſince it remaines of a tranſparent, but very dull clearneſs, in no degree ſo bright, and flickering, as the other. If this proves a diſtillation of the ſame kind, and not differing from diſtillations by heate, then it may excuſe my expreſſion above, of the coincidence of extreames. If it proves a diſtillation of another kind, then there is a freſh task for Philoſophers. However, whether one or the other be true, we are ſure, that falſe grounds and vain hopes have done Infinite good to us and to our Poſterity by *Pyrotechne*. And why may not we accept of ſpecious hopes to attempt ſomething in *Pſychrotechne*? But I made another tryal with the ſtronger Thermometer: By which, and by other arguments, I am convinced, that manifold uſes may be made of our Icy Conſervatories for the Conſervation of ſome Bodyes, and for ſtrange alterations on others, as they are placed, higher or lower; nearer to or further from the Snow or Jce. But this and other matters, and eſpecially ſuch as pertain to the quick and cheap fertilizing of any ſorts of Land for Hortulan uſes, I muſt reſerve for another time: And then I ſhall not put you off with Projects; but give you the evidence of ſure and ſafe Experience; and ſuch as may be much more uſeful, than this or the former is either curious, or extravagant.

De Reſpirationis Uſu Primario Diatriba, *Auth. Malachia Thruſton M. D. Cui accedunt Animadverſiones à Cl. Viro in eandem conſcriptæ, una cum Reſponſionibus Authoris. Londini, apud* Joh. Martyn, *Reg. Societ. Typographum ad inſigne Campanæ*, 1670.

THis Learned Author, a worthy Member of the *R. Society*, in diſcourſing upon this no leſs difficult than important ſubject, obſerves this Method;

Firſt, he lays for a ground, that there is and needs muſt be Motion in the Bloud. *Secondly*, he declares, what kind of Motion, and how various that is, ſhewing alſo, that all thoſe motions are to be adſcribed to the *Vital Bloud*, and to be preſerved therein. *Thirdly*, he maketh it his buſineſs to prove (which is his main deſign) that thoſe Motions are both continually produced, and maintained by the means of *Reſpiration*, premiſing ſomething about the Nature and Properties of the *Air*, and the *Fabrick* and Motions of the *Pneumatick* parts.

This done, he ſheweth the probability of his *Hypotheſis*, as being intelligible, and able to ſolve innumerable queſtions, and among them ſuch, as have been eſteemed almoſt inſoluble. And *firſt*, he teaches, how Reſpiration maintains that *Progreſſive* Motion, which he alſo cals the Motion of *Rivers*; and then, how it preſerveth the Motions of *Fluidity*, and *Warmth*, by the Airs ſubduing, comminuting, and dilating the Blood. Where he digreſſeth to give an Anſwer to thoſe, that will not allow the Air to have any ingreſs into the Bloud; as alſo to explain the cauſe of *Sanguification*, adſcribing it neither to the Heart nor the Liver, but principally to the *Lungs* in thoſe that are borne; but in *Fœtus's*, to the maternal Bloud, and the Vmbilical veſſels.

Next, he proceeds to explicate the many *Problems* of Reſpiration by the delivered *Hypotheſis*: And chiefly why Reſpiration is ſo abſolutely neceſſary to Life, viz. becauſe Life principally conſiſts in the motion of the Bloud; which ſoon ceaſeth, when Reſpiration is ſtopp'd. Upon which Queſtion thus reſolved, depends alſo the ſolution of divers others, to be found in this Book.

To all which he adds the reaſon of the Difference, there is, as to Reſpiration, between the Borne and Vn-borne; ſolving that knotty *Hervean* Problem, *viz.* Why a *Fœtus*, being diveſted of the Secondine, and having once breathed in the open Air, cannot live afterwards without it, but dyes preſently? Which he imputes to the hindred Motion of the Bloud, entertained by Reſpiration.

But why, after that Reſpiration hath once begun, the Bloud will not, when there is need, return to its former paſſage through the *Foramen Ovale*; we refer to the Author himſelf for an Anſwer: as we alſo do for other conſiderable Solutions of many other difficulties occurring in this Learned Treatiſe.

An

An Alphabetical Table for the Fourth Volume of the Philoſophical Tranſactions.

The Firſt Figures relate to the Number *of Tracts, the Second, to the* Page.

A.

EQuations in Numbers, the reſolution of them, 46. 929.

Ætna's Eruptions, 48. 967.

Air very ſalubrious in *Japan*, but of another temper on the one, then the other ſide of the Mountains there, 49. 984.

Anatome of a Silk-worm. See *Malpighi* in the Title of *Books*. Of a Cameleon, Caſtor, Dromedary, Bear, *African* She-goat, 49. 991.

Of a double Matrix, or ſomething like it, 48. 959.

Of the Heart and Motions of the Bloud, and the degrees of Motion. See D. *Lower* in *Books*. Of the Organs of Generation, 52. 1043. See more Anatom. Obs. in the Books of *Kerckringius*, and Obs. Med. *Leyſeri*, *Steno*.

Anſwers to ſome Queries about *Japan*, 49 983.

Art of working Lacca very rich and coſtly in *Japan*, 49. 985.

Arts of Geometry, Arithmetick, Algebra. See Sluſu Meſolabum, Ferguſon in *Books*. *Arts* of Painting and Sculpture, 47. 953.

Artificial inſtrument, for drawing any Object in Perſpective, 45. 898. and another for Hyperbolical Glaſſes, 53, 1059.

Aſtronomical Obſervations of *Saturn* rectifyed, 45. 900. Of a Solar Eclipſe, and the motion of the Moon deſign'd to be rectify'd, 55. 1099.

Judiciary *Aſtrology* highly eſteem'd in *Japan*, 49. 985.

B.

BArometrical and Thermometr. Obſerv. *N.* 55. [illegible].

Bloud. The Transfuſion of Bloud in a Man queſtion'd at Law in *France*, 54. 1075. No Bloud-letting in *Japan*; but Cauſtics, Mugwort, and burnt Cotton frequently uſed, 49. 984.

Books. Deſcription *Anatomique* d'un Cameleon, Caſtor, Dromedaire, Ours, & d'une Gazelle, 49. 991.

Anderſons Guaging, 47. 900.

Fr. *Bayle* M. D. Syſteme Gen. de la Philoſophie, 54. 1094.

Th. Bartholin de Cygni Anatome, 50. 1021.

Er. Bartholin. de Cometis 1664. 1665. *n.* 53. *p.* 1071.

Gu *Beveregii* Cant. Inſtitutionum Chronol. lib. duo, 47. 956.

Mr. *Boyles* Phyſiol. Eſſays 2d Ed. enlarged; with a Tract of the Reſtleſneſs of particles in ſolid Bodies, 53. 1059.

M *Charas* de la Theriaque d' Andromachus, 52. 1058. Nouvelles experiences ſur la Vipere, 54. 1091.

Abbrege

Abbregè *Chronologique* de l' Hiſt. ſacree & profane per le P. *Labb*, 50. 1022.

M. *Dary's* Guaging epitomized, 52. 1055.

Mr. *Evelyns* Sylva & Pomona 2d Edid. much enlarg'd, 53. 1071.

Joh. jac. Ferguſon Labyrinth. Algebræ, 49. 995.

Nath Higmor. M. D, de Hyſter. & Hypochondr. paſſione Reſponſio ad D. Willis, 54. 1087.

Th. Hobbes Quadrat. Circuli, Cubat: ſphæræ *&c.* refutata á J. Wallis D. D. 48. 971. denuo refutata ab eodem, 55. 1121.

W. Holder D. D. on the Elements of Speech, intended for teaching the Deaf and Dumb to ſpeak, 47. 958.

Theod. Kerckringii M. D. Spicileg. Anatomicum, & de Oſteogenia Fætuum, 54. 1094.

Latin, how to be taught by Uſe alone, 48, 975.

Mich. *Leyſeri* Obſerv. Medicæ, 50. 1018.

Rich. Lower M. D. de Corde, it. de Motu & Calore ſanguinis, 45. 909

Marc. Malpighi de Bombyce, 49. 987.

Rob. Moriſoni M. D. Præludia Botanica 46. 934.

Piet. Mar. Mutoli del Movimento della Cometa 1664. *n* 53 *p.* 1069.

Cl. Salmaſii Præfat. in lib. de Homonymis Hyles Iatricæ, 46. 935.

Ren. Fr. Sluſii Meſolabum, 2da Edit. auctior, 45. 903.

See other Improvements of the ſame by Engliſh and Dutch, 46. 929. & 49. 996.

G. Sinclari Ars Gravit. & Levitatis, 50. 1019.

Æg. Stravchii Breviar. Chronologé. 50. 1022.

Steno du Cerveau, 51. 1034.

Ott. Tachenii Hippocrates Chymycus, 50. 1019.

Balth. Telles Hiſt. of Ethiopia; the Head of the Nile, *&c.* 48. 672.

D *Thruſton* de Reſpir. 56. 9.

Mr. *Webbs* Hiſtor. Eſſay, to prove the Language of *China* to be the Original Tongue in Paradice, 48. 973.

J. Walliſii D. D. Mechanica ſive de Motu, Tractat. Geometricus, 54. 1086. His other works where to be had, 48. 972.

D. *Wittie's* defence againſt M. Sympſon's Hydrol. Chym. 49. 999. Some reflexions made on the Extract of that Book 52. 1050.

So far Books.

Breaſts ſuddenly growing to an exceſſive bigneſs, 52. 1047. and 53. 1068.

Buildings, very rich, and richly adorn'd, but of one only Story high in *Japan*, 49. 985.

A *Burning* Concave of 34 inch. Diameter, and its effects, 49. 986.

C.

C*Hriſtians* hated in *Japan*, becauſe ſome Profeſſors of it there would perſwade, that there was a Power above the Dignity Royal, diſpoſing of Crowns: yet the Morals of the Japoneſe good, they puniſhing lying and detraction, 49. 986.

Chronology. See in *Books*, Beveregius, Labbé, Stravchius.

Chryſtal, how found in the Mountains of Helvetia, 49. 982.

Colours and Dyes in *Japan* more laſting than elſewhere, 49. 985.

Comets of 1664, and 1665. See in *Books* Er. Bartholin. and Mutoli.

Commodities Merchantable in *Japan*, 49. 985

D

Amps in the Mines of *Hungary*, their effects, 48. 963.

Diet in *Japan*: No uſe there of Butter, Cheeſe, nor love of Milk, 49. 984.

Divertiſements and Recreations in *Japan*, 49. 985.

G.

Gold-mines incredibly rich in *Japan* and rich Jewels there, 49. 985.

Guaging promoted. See in *Books*, Anderſon and Dary.

I.

Ndies. A curious Accompt of a voyage to the *Eaſt-Indies* by ſea, 50. 1003.

An *Invention* of weighing water in water with ordinary ballances and weights, by Mr. *Boyl*, 50. 1001.

An *Invention*, of grinding Hyperbolical Glaſſes by Dr. *Chr. Wren*, 53. 1059. Of drawing in Perſpective, by the ſame, 45. 898.

L.

Lake in *Carniola* of ſtrange qualities, 54. 1083.

Liquors, the ſtrange and ſecret changes of them examin'd by Dr. *Beal*, n. 56.

M.

Athematical Mechanicks. See Artific. Inſtruments. The Generation of an Hyperbolical Cylindroid demonſtrated, 48. 961.

Applyed for optical uſe, 53. 1059.

Medical waters, Medical hot-Springs, and Medical applications in *Iapan*, 49. 984.

Mercurial Mines in *Friuli*, 45. 1089.

Mineral waters, their Analyſis, by Dr. *Highmore*, N. 56. See Dr. *Witty* in Books; and Reflections, 52. 1050.

Meteors, Mock-Suns, 47. 953.

Motion, the Laws of it by M. *Hugens*, 46. 925. and Dr. *Wallis*, whom ſee in *Books*.

A *Mountain* in *Iapan*, higher than Pico in *Tenariff*, 49. 984. Eight

ſt

to the very top, *ibid.*

Musk-Melons; how to be order'd, 45. 901. and 46. 923.

O.

Pticks. To grind Glaſſes of an Hyperbolical Figure, 48 961. and 53. 1059. *In Perſpective* how to draw by an Inſtrument. 45. 894.

Alt, How made in *France* by the Sun, 51. 1025.

Salt-Springs, and the Salt-work at *Nantwich* deſcribed, 53. 1060. Appendix to the ſame. 54. 1077.

Saturns

Saturns Obſervations rectify'd, 45. 900.

Sea, Ocean and Mediterranean joyn'd in *France*, *N*. 56.

Silver in high perfection in *Japan* but not uſed there in Trade, in which is ſeen nothing but Gold, and ſmall Coyn of Braſs, ſpoiled by refining it too much, 49. 984.

Slate, call'd Corniſh-Slate; the variety, choice, and ordering of it, with a computation of the charges in covering Houſes, 50. 1009.

Snails, the odd turn of ſome of their Shells, contrary to the Solar turn, 50. 1011.

Spiders, who by their darting cauſe thoſe Cobwebs flying in the Air, 50. 1014,

The *Southern* Pole not to be approached as the *Northern*, but bitter cold, ſtorms, &c. at great diſtance from that Pole, 50. 1008.

Springs; Saline, in Somerſetſh. and Medical in Dorſetſh. The cauſes of Mineral Springs inquired into by Dr. *Beale*. Reflexions on Dr. *Witty*'s Defence concerning the Mineral Springs at *Scarborough*. *N*. 56.

Steel, excellent in *Japan*, but not ſo well temper'd now as formerly, 49. 984.

T.

THea and Tobacco uſed at all viſits in *Japan*, 49. 985.

Theaters of wonderful curioſity and artifice in *Japan*, 49 985.

V.

COncerning *Vegetation* and Vegetables in general: promiſcuous additions to *N*. 43.

Here *N*. 46. *P*. 913. The correſpondence of the Pith and Timber with the ſeed of the Plant: and of the Bark or Sap in the Bark with the Pulp of the Fruit, by Dr. *Beale*, 46. 919. Motion of Sap in Trees, by Mr. *Willoughby* and Mr. *Wray*, 48. 963.

Voyage to the *Eaſt Indies*, *N*. 50.

W.

PEndulous *Watches* how to be apply'd to diſcover the Longitudes at Sea, with Methods for Journals, &c. 47. 937. An Additional remark to the ſame Subject, 48. 976.

Waters, The *Engliſh* hot Bath-Springs, 49. 977. Medical Springs, Mineral Springs. See Dr. *Witty* in *Books* Reflexions, 52. 1050. and *N*. 56.

Winds, What winds hold or change moſt in all the voyage by ſea to the *Eaſt Indies*: The Tornado deſcribed &c 50. 1003.

Writing, They write downwards in *Japan*, 49 986.

ERRATA.

N N. 55. *p*. 1119. *l*. 3. *r*. 28 *inches*. In this Numb. 56. *p*. 1127. *l*. 2. *r*. *Ser*. *p*. 1135. *l*. 26. *r*. *our Land*. *p*. 1134. *l*. 38. *r*. *diſlocations*.

PHILOSOPHICAL
Tranſactions:

GIVING SOME

ACCOMPT

OF THE
Preſent Uudertakings, Studies, and Labours
OF THE

INGENIOUS

IN MANY
CONSIDERABLE PARTS
OF THE

WORLD.

VOL. V.
For *Anno* 1670.

LONDON,
Printed for *John Martyn* at the Bell in St. *Pauls* Church-Yard; Printer to the *Royal Society*.

TO
THE TRULY NOBLE
PHILOSOPHER,
ROBERT BOYLE Eſq;

Brother to the Right Hononrable the
Earl of Burlington, &c.

SIR,

I *Cannot forbear any longer to addreſs one of the Volumes of theſe* Tranſactions *to You, to whom I moſt willingly profeſs I am ſincerely devoted, and who is known to have obliged the learned World with ſo many uncommon Diſcoveries in Nature, and ſo ſolidly maintain'd the Power and Uſefulneſs of Experimental Philoſophy. And this I do by offering you* this *Volume, becauſe in it (beſides other parcels of not ordinary remark elſewhere interſperſed) two of the Twelve Tracts are almoſt entirely your own; of which the judicious do generally affirm, that though they are draughts written only for your own memory, and have not yet the poliſhing of your laſt hand, yet they contain moſt diving Reſearches into ſome of the deepeſt Receſſes of Nature, that ever appear'd in Publick; and have moſt induſtriouſly examin'd the Breath and Fuel of Life; the State of Air, and Water,* in the various degrees of Rarity and Denſity, Weight, and Abſence, longer or ſhorter, for the Reſpiration of Animals; And have left us manifeſt evidences of the neceſſary Weight, and other enforcements of Air, to preſerve us from Suffocations and Convulſions; And that neither common Liquids can raiſe their Uſual Steams, nor the minuteſt Inſects continue their Motion even whilſt they retain life, without the Preſence and Help of Air.

And yet I may be asked, what Patronage, what Heroe, or what Genius can give ſafe guard againſt the malicious ſcurrility of many of this Age, who attempt to deface every vertue, and whatſoever is excellent, and particularly that which is moſt obliging to the Publick? To this diſcouragement I reply cheerfully, that the malicious and ſcurrilous are ſhort liv'd, and will ſoon expire in an odious ſnuff, or will haſten to hide themſelves in ſhame and confuſion: But Truth is mighty and will prevail; Wiſedome will be juſtifi'd; Vertue will in good time emerge; Knowledge will abound; Arts will flouriſh; and Poſterity will applaud them, from whom they receive the cleereſt Light and the beſt Accommodations.

I am inform'd by ſuch as may well remember the beſt and worſt days of the Famous Lord Bacon; That though he wrote his Advancement of Learning, and his Inſtauratio Magna, and many other elaborate Treatiſes of Philoſophy, in the time of his greateſt power; yet his greateſt Reputation rebounded firſt from the moſt Intelligent Forrainers in many parts of Chriſtendome: It cannot be doubted, but that England had then better knowledge of the abſtruſities, many troubles and burthens of our Municipal Laws, and Chancery, which lay long and much upon his ſhoulders; And that he bore the ſtreſs of State affairs in almoſt all King James's days, and in Queen Elizabeth's later days; That he adorned the ſolemn Addreſſes, and was the Extra-ordinary Pen-man for moſt Apologies, Deliberations, and graveſt Adviſo's in Parliaments, and otherwiſe: Here they ſaw alſo, How he excelled in the beſt Theology of that Age, and in the Politeſt of Civil and Moral Eſſays: And therefore here they might juſtly wonder, how a perſon ſo publickly immerſed in all Civil Intereſts ſhould find leiſure to do any thing at all in Philoſophy: And much more juſtly may we ſtill wonder, how, without any great ſkill in Chymiſtry, without much pretence to the Mathematicks or Mechanicks, without Optick Ayds, or other Engins of later Invention, he ſhould ſo much tranſcend the Philoſophers, then living, in judicious and clear inſtructions, in ſo many uſeful Obſervations and Diſcoveries; I think, I may ſay beyond the Records of many Ages. Hence, and from all this I would infer, that all Mortals muſt wait for their juſt renown poſt cineres, after their mortality; and that Envy lyes cloſe at the doors; and purſues great merit to the laſt ſtages of life.

Sir, As the Greek Poet fetch'd in Caſtor and Pollux for his higheſt applauſes, when he had another concernment in his chief aim; ſo, that I may not by any Temptation put your Modeſty to a bluſh, I muſt continue to diſcourſe of the Lord Bacon, Gilbert, des-Cartes, Gaſſendus, and others the Miracles of modern and revived Philoſophy; of the indefatigable induſtry of ſome; the ingenious Contrivances of others; and of many their ſucceſsful performances. And truly 'tis to me very ſtrange, that ſeveral of theſe Excellent perſons have ſo luckily eſpouſed thoſe Hypotheſes of Nature in many true particulars, which You have by manifeſt Experiments evinced and confirm'd; as if by an eſpecial bleſſing upon their Labors, and for their good Affections towards Man-kind, they had been guided by an Heavenly Ray to divine, what would be the Reſult from diligent Tryals.

And, ſince a noyſe hath been raiſed by temerarious Cenſurers againſt you, as if you were too indulgent to the old Atomiſts, I hold my ſelf bound in Juſtice, to take publick notice of your impartiality, that you were neither led aſide on the one hand by the addiction to Chymiſts, to favour their Principles above truth; nor on the other hand, deterr'd by the Heatheniſh miſtakes about Atoms; nor by the Vulgar notions of the Elements, from giving due place to the Corpuſcularians (ſo far as they might have Truth on their ſides) even by the Aſſiſtance of Chymiſtry; as you have done moſt candidly in your Sceptical Chymiſt, and in your Origine of Forms and Qualities.

And now Sir, this would look more like a neglectful Omiſſion of due Reſpects, than a juſt Addreſs, if I ſhould forbear to acknowledge, that you have ſo coherently deduced, and ſo conſpicuouſly illuſtrated the General, and the leſs Obvious Proceſſes of Nature in her Occult and ſubtile Influences, Whether Atmoſphærical, or more remotely Coſmical; Whether Celeſtial, Æthereal, or Aereal; Whether Subterraneous or deſcending; Whether of Air, or any known kind of Water, Liquids, or Menſtruous; Spirituous, *or in ſome degree Incraſſated; their Hydroſtatical tendency, Weight, or State; that it muſt give abundant ſatisfaction to future Ages, eaſe them of much pains, and allow them the more leiſure and manifold Aſſiſtances for further Proceſſes. I muſt add, that in the Treatiſes of* Firmneſs *and* Fluidity, *of* Cold, *and the* Thermoſcopical *Meaſures of Warmth and Frigidity; of* Colours *and* Light, *you have given us good ground for our Reſt, and for a fair proſpect into the Labyrinths of Nature. Beſides, I muſt take the freedom to ask, Who did ever ſuſpect the Ambient Air of having ſuch a force to conſolidate firmneſs in ſtubborn and unflexible Bodies, as you have ſhew'd it to have? Who ſuſpected, that Air (the pureſt we can obtain ſo near the ſurface of the Earth) ſhould ſo widely* Expand *it ſelf when at ſome liberty; or ſhould endure ſuch Mechanical* Compreſſions? *That the moſt* Solid *Bodies we have amongſt us ſhould emit ſpacious Atmoſpheres; and that the parts of our firmeſt Rocks and Jewels are not in an* abſolute *Reſt in their long laſting duration? What divining Imagination or Conjecture did admit of all theſe points for ſound Philoſophy, till you taught us to feel it in our Scales, and to ſee it with our Eyes?*

But I muſt not here heap up together your many coſtly and aſſiduous Labours: I muſt ſtop my Pen, and conſider more what your Ears can bear, than what is due to your Merit. Only this I muſt here avouch, as one amongſt a great number of good Witneſſes, that many of the moſt learned Forrainers (to ſay nothing now of worthy Engliſhmen) do ſo highly value all the Treatiſes you have publiſhed, that they do importunately deſire, your Desks were forthwith emptied into the publick Light, and carefully rendred into their known Languages.

Sir, all that value true Worth and true Philoſophie, are bound to pray for the Recoverie of your Health and Strength, and for your long Life, and perpetual Increaſe in all Happineſs. So does he, who eſteems the moſt uſeful things in Human Societie, to be Knowledge *and* Vertue, *(combined in you,) and who is*

SIR,

Your very Humble and Faithful Servant,

HENR. OLDENBURG Soc. Reg. Secr.

Numb. 57.
Beginning the Sixth Year.

PHILOSOPHICAL TRANSACTIONS.

March 25. 1670.

The Contents.

A Preface to the Sixth *Year of theſe Tracts. Some Communications from* New England. *The Ingenious Reflexions relating to* Medical Springs *Numb.* 52, *Conſidered. The palpable Indications of ſome* Healing *Springs remarked: with an Accompt of ſome ſuch Springs in* England, *which confirm the Indications, and of others* obiter. *A Proſecution of the formerly begun Inquiries, Directions and Experiments, concerning the* Motion *of* Sap *in Trees. Some Conſiderations touching the Geometrical Method of Signor* Caſſini *for finding the Apogees, Excentricities and Anomalies of the Planets. An Accompt of 3. Books,* I. *Experienze intorno alla GENERATIONE DEGL' INSETTI, fatte da* Franc-Redi, *Academico della* Cruſca. II. *PHARMACOPOEIA REGIA, ſive Diſpenſatorium novum locupletatum & abſolutum, cum annexa* Mantiſſa Spagyrica, *&c.* III. *AFFECTIONUM quæ dicuntur HYSTERICÆ & HYPOCHONDRIACÆ Pathologia Spaſmodica Vindicata: nec non Exercitationes duæ, 1. De SANGUINIS ACCENSIONE. 2. De MOTU MUSCULARI, Auth* Tho. Willis, *M. D. &c.*

A Preface
To the *Sixth* Year of theſe Tracts.

IN *this Month of* March *we enter into the* Sixth *Year of our Philoſophical Communications; which if in any meaſure they have been acceptable to the Ingenious, we have our aim, and the ſatisfaction we deſire.*

Before I enter upon new matter, I ſhall beg the Readers leave to caſt an Eye back, as formerly, and review what we have endeavour'd to do hitherto, that I may remark the concernments, why, and upon what occaſion I adopted the Arguments all along; and that I may thence take freſh encouragement, and clearer inſtruction for our future Collections.

In the laſt Preface *before our* fourth *Volum, I gave a* Synopſis *of the main importance of our* three *foregoing Books, inſerting a particular recommendation of the extenſive Uſefulneſs of ſome Artificial Inſtruments lately invented. To the Catalogue of Inſtruments there recited, or hinted, we have ſince added (in the 4th* Vol.*) ſome Inventions or Applications, which either have not been formerly thought of, or have been long ſought and in vain attempted, or have made diſcovery*'s *contrary to old Expectations, and even ſometimes to the confident Aſſertions of Acute and very Inquiſitive men. What* Peripatetick *would endure to hear of weighing water in water?* There *we have a Demonſtration, How to eſtimate the particular weight of any quantity of Liquors in Liquors, exactly, and by ordinary Balances and Weights. And this is performed by the ſame happy hand, which before directed us, How to find and denominate the particular Weight of any parcel of Air in Air, or of any Pillar of Air of the whole Atmo-ſphere, of any ſize, in any place where we can come, whether clear'd, or laden with exhalations, clouds, ſnow, hail, or other Meteors, how high ſoever they aſcend; and the ſame ſlight Engin (the Ballance) hath in the ſame hand detected an Atmoſphere in the moſt Solid Bodies.*

'Tis a long time ſince the Mechanical Witts have conſulted, How to improve Optical Glaſſes *by the* Hyperbolical *Section:* There *we have the Propoſition demonſtrated, and the Engin directed for practice. The skill of drawing in* Perſpective *is as a pleaſant Companion to the Travaylor, and enables him to give a lively Hiſtory of his Travels for the information of others:* There *we may find, how to draw in Perſpective any Objects both accurately and diſpatchingly, by an Inſtrument; as any vulgar hand may draw a Circle more perfectly by a Compaſs, than the moſt perfect Penman can do by his hand alone: And we have gotten a little ſtep on towards the advancing of Metalline Burning Concaves, of which the performance is there particulariſed.*

We ſhall not inſiſt on the Advancements, we have there given notice of, in Anatome, in Mathematicks, and particularly in diſcovering the Lawes of Motion; in the Labyrinths of Algebra; the Reſolution of Æquations in Numbers; Guaging; Directions how to find the Longitudes by the Pendul; Aſtronomicals &c.

We have been allarm'd by the extraordinary Eruptions of Mount Ætna, *to inquire more diligently into the Cauſes and Effects of thoſe Subterraneous Fires; the Prognoſticks and Concomitants of thoſe Eruptions; what Minerals they have indicated or ejected: Of which we yet expect much better ſatisfaction from an eminent Philoſopher, who lives near the place to obſerve all circumſtances. Alſo the Drought of this Summer, and of a good part of this Winter, hath minded us to inquire further into the cauſes, varieties and properties of Springs; of Subterranean Steams and Liquors. There we have alſo the Art uſed* to make Salt *of Sea-water by the Sun, and of Salt ſprings by Coppers, Boylers and Furnaces. Our Engliſh Hot-ſprings at* Bath *after ſecond diſquiſitions reported. Our Baroſcopes have ſhew'd the Air to be more ponderous, even when it was cleareſt, ſometimes in a bright and warming Sun-ſhine, and ſoon after the Winter-ſolſtice, than ever, I think, we found it, ſince we were inſtructed to apply the Inſtrument for ſuch diſcoveries. And the ſame we might affirm of the Froſts following about a fortnight after the Solſtice* (that they were more extreme, than in very cold winters before,) *if we had not had ſome doubt, that the liquor in the Thermometer might in time ſuffer ſome change, or diminution, which might elude the true and punctual indication, when we compare one year with an other for many years together.*

Some Learn'd men have taken much pains, diſputed, written and read much, to find out the Head of the Nile, *and the Cauſe of that Rivers Inundation.* There *we have the true diſcovery, addreſſed to the* R. Society.

We have alſo mentioned the way of teaching Latin, *as of old it was learnt, and as other Languages are taught by* Uſe *alone. We have given notice of a Foundation laid to teach the Deaf and Dumb to ſpeak. We have ſhew'd by brief touches from the wealthy* Japan, *How much knowledg and Philoſophy may be contain'd in a faithfull Hiſtory of Places. And an Eaſt-Indian Voyage, as there de-*

ſcribed, may both prepare and inform thoſe that are embarked in that adventure, and alſo give the Light of various Arguments to our domeſticks.

Chronology affords us the beſt view of all Times paſt; but, after all Emendations, is ſtil involv'd in much obſcurity: There *are freſh Eſſayes to extricate the difficulties; and ſeveral hands at work, to remark the Products of all former Ages.*

Medical Obſervations of peculiar curioſity. and the Singularities of Humane Bodies are not pretermitted. The Reſtleſneſs of particles in Solid Bodies repreſented, and modeſtly argued. Botanicks happily entertained, and reduced to a Natural Method. The Sylvan, Hortulan and Olitory affairs, for Forreſts, Groves, Orchards, Nurſeries, and fruitful Gardens revived with great vigor, and with manifold ſupplies. Vegetables brought under a Philoſophical conſideration: The Motion and the uſes of Sap in Trees diſcuſſed: The nearer affinity of their ſeveral parts inquired, to the intention of altering, mixing and multiplying divers kinds very many ways. The Musk-melon how to be cultivated to great perfection, &c.

Thus we have briefly touched, what parts of uſeful Philoſophy are now advancing; and theſe being the labours and ſtudies of others, I preſume, I may, without offence to any good men, claim the freedom to give them due applauſe. And now, let Envy ſnarle, it cannot ſtop the Wheels of Active Philoſophy, in no part of the known world. Not in France, either in Paris *or at* Caen. *Not in* Italy, *either in* Rome, Naples, Milan, Florence, Venice, Bononia, *or* Padua. *In none of the Univerſities, either on this or that ſide of the Seas.* Madrid *and* Liſbon, *all the beſt Spirits in* Spain *and* Portugal, *and the ſpatious and remote dominions to them belonging; the Imperial Court, and the Princes of* Germany; *the Northern Kings, and their beſt Luminaries; and even the frozen* Muſcovite *and* Ruſſian, *have all taken the Operative ferment; and it works high, and prevails every way, to the encouragement of all ſincere Lovers of Knowledg and Vertue.*

An Extract of a Letter,
Written by John Winthrop Eſq; *Governour of* Connecticut *in* New England, *to the Publiſher, concerning ſome Natural Curioſities of thoſe parts, eſpecially a very ſtrange and very curiouſly contrived Fiſh, ſent for the Repoſitory of the* R. Society.

I Know not, whether I may recommend ſome of the productions of this Wilderneſs as rarities or novelties, but they are ſuch as the place affords. There are, amongſt the reſt, 2. or 3. ſmal Oaks, which though ſo ſlender and low (as you may ſee, if they come ſafe) have yet Acorns and cups upon them, ſo that it may be truly ſaid, that there is a Country, where Hoggs are ſo tall, that they eat acorns upon the ſtanding growing Oakes. This is every year viſible in many parts here, there being of this ſort of dwarf-Oak whole Forreſts in the Inland Country; too many for the Husband-man, who finds that ſort of land moſt difficult to break up at firſt with his plough, in regard that the whole ſurface is fill'd with ſpreading ſtrong roots of this ſort of Oak. Neither muſt it be thought, that they are ſmall ſhoots, which in time would grow big trees; for, where theſe grow, there are no great Oaks, or very few amongſt them. But whether it be a novelty to ſee ſuch kind of dwarf-trees bearing acorns, I know not: It was to me, having not ſeen the like (as far as I remember,) in *England* or *France*, or other parts. Mean time I have obſerved, that in ſome Plains, full of theſe ſhrubs, there have been no acorns on moſt of them; but whether in other years they were not fruitful, I know not. Some years, we know, even the great Oaks bear no fruit, which are very full at other times; but this year throughout the whole Country there is plenty of acorns; and I ſhould be glad to be informed, whether this year they have been alſo abounding in *England*, or other parts of Europe; and if ſo, or not ſo, poſſibly ſomething not altogether inconſiderable may be thence inferr'd. Beſides, if ſuch dwarfiſh Oakes, as theſe, ſhould be found in other parts of the World, it were not amiſs, me thinks, to inquire, Whether it be not ſome Mineral ground, where theſe grow; and if ſo, what ſorts of Minerals thoſe places afford?

There are alſo ſent you ſome pieces of the Bark of a Tree, which grows in *Nova-Scotia*, and (as I hear) in the more Eaſterly parts of N. *England*. Upon this bark there are little knobs, within which there is a liquid matter like Turpentine (which will run out, the knob being cut open) of a very ſanative nature, as I am informed by thoſe, who affirm, that they have often tryed it.

In the ſame Box are Pods of a Vegetable, we call *Silk-graſs*, which are full of a kind of moſt fine down-like Cotton-wool, many ſuch flocks in one and the ſame pod ending in a flat Seed. 'Tis uſed to ſtuff up Pillows and Cuſhions; being tryed to ſpin, it proves not ſtrong enough. The Seeds 'tis like may grow with you, if ſet in ſome Garden; whereby the whole Plant may be ſeen.

You'l find alſo a Branch of the Tree, call'd the Cotton-tree, bearing a kind of Down which alſo is not fit to ſpin. The Trees grow high and big. At the bottom of ſome of the Leaves, next to the ſtalk of them, is a knob, which is hollow, and a certain fly, ſome-what like a pis-mire-fly, is bred therein.

More-over, there are ſome of the *Matrices*, in which thoſe Shels are bred, of which the *Indians* make the white *Wampanpeage*, one ſort of their mony. They grow on the bottom of Sea-bays, and the ſhels are like Periwinkles, but greater. Whilſt they are very ſmal, and firſt growing, many of them are within one of the concave receptacles of theſe *Matrices*, which re very tough, and ſtrong, ſo contrived, that they are ſeparate from one another, yet ſo, that each of them is faſtned to a kind of skin, ſubtended all along to all theſe caſes or baggs.

There is, beſides, in a large round Box, a ſtrange kind of *Fiſh*, which was taken by a Fiſherman, when he was fiſhing for Codfiſh in that Sea, which is without *Maſſachuſet* Bay in N. *England*. It was living, when it was taken, which was done, I think, by an hook. The name of it I know not, nor can I write more particularly of it, becauſe I could not yet ſpeak with the Fiſherman, who brough it from Sea. I have not ſeen the like. The Mouth is in the middle; and they ſay, that all the Arms, you ſee round about, were in motion, when it was firſt taken.

We omit the other particulars here, that we may reflect a little
See Fig. I. *upon this elaborate piece of Nature, the* Fiſh, *which,*

ſince it is yet nameleſs, we may call Piſcis Echino-ſtellaris Viſciformis; *its Body (as was noted by M.* Hook) *reſembling an* Echinus *or* Egg-fiſh, *the main Branches, a* Star, *and the dividing of the branches, the Plant* Miſſel-toe. *This Fiſh ſpreads itſelf from a* Pentagonal *Root, which incompaſſeth the Mouth (being in the middle at* a) *into* 5 *main Limbs or branches, each of which, Juſt at the iſſuing out from the Body ſub-divides it ſelf into two (as at* 1.) *and each of thoſe* 10 *branches do again (at* 2.) *divide into two parts, making* 20. *leſſer branches: Each of which again, (at* 3.) *divide into* 2. *ſmaller branches, making in all,* 40. *Theſe again (at* 4.) *into* 80; *and thoſe (at* 5.) *into* 160; *and they (at* 6.) *into* 320: *they (at* 7.) *into* 640; *at* 8, *into* 1280; *at* 9, *into* 2560; *at* 10, *into* 5120; *at* 11, *into* 10240; *at* 12, *into* 20480; *at* 13, *into* 40960; *at* 14, *into* 81920: *beyond which, the farther expanding of the Fiſh could not be certainly trac'd, though poſſibly each of thoſe* 81920 *ſmal ſprouts or threds, in which the branches of this Fiſh ſeem'd to terminate, might, if it could have been examined when living, have been found to ſubdivide yet farther. The Branches between the Joynts were not equally of a length, though for the moſt part pretty near: But thoſe branches, which were on that ſide of the Joynt, on which the preceding Joynt was placed, were always about a* 4th *or* 5th *part longer than thoſe on the other ſide. Every of theſe branchings ſeemed to have, from the very mouth to the ſmalleſt twiggs or threds, in which it ended, a double chain or rank of pores, as appears by the* Figure. *The Body of the Fiſh was on the other ſide; and ſeemed to have been protuberant, much like an* Echinus (Egg-Fiſh *or* Button-Fiſh) *and, like that, divided into* 5. *ribbs or ridges, and each of theſe ſeemed to be kept out by two ſmall bony ribbs.*

In the Figure *is repreſented fully and at length but one of the main branches, whence 'tis eaſy to imagine the reſt; cut off at the* 4th *ſub-dividing Branch, which was done to avoyd Confuſion as well as too much labour and expence of time in the Engraving.*

The Figure, well viewed and conſidered, will be more inſtructive, than a larger Diſcourſe thereon; though other particularities might have been mention'd, if the dryneſs, perplexedneſs and brittleneſs of the Fiſh had not hindred it.

The Ingenious Reflexions relating to Medical Springs *Numb.* 52, *Conſidered. The palpable Indications of ſome* Healing *Springs remarked; With an account of ſome ſuch Springs in* England, *which do confirm the Indications; and of others* Obiter; *By Dr.* J. Beale *to the Publiſher: Which Diſcourſes were in* N. 56. *omitted for want of ſufficient room, not without injury to the Author, who had deſigned theſe Communications for another prop, ſpecifying by manifeſt obſervations, how Terreſtrial ſteames may be the Generative Cauſe, both of Minerals and Metals, and of all the Peculiarities of Springs: And ſhould have immediately followed* p. 1134.

I*N purſuance of what I offered* (Numb. 56.) *concerning* Mineral *Springs, I proceed to the Ingenious Reflexions made* Numb. 52 *on the Breviate of Dr.* Witties *Defence, which is in your* Tract 51; *With no* Intention *at all to affront the worthy Authors modeſt Suggeſtions; but to repreſent matter of Fact, and manifeſt Obſervations, which may chance to ſatisfy ſome of his Inquiries; And to give more Light to my forementioned Arguments.*

We agree that ſome *Medical* Springs do looſe part of their Vertue by the precipitation of a Mineral Sediment. But, whether theſe Waters do not looſe ſome of their Vertue (and perhaps the more excellently *healing* property) by a ſeparation of finer and Inviſible Spirits from the water, either by avolation out of the ſealed Veſſels, or otherwiſe; This is now a part of my preſent Queſtion. And I would here have a regard to other *Healing* Springs, than are apparently Mineral. And thus far I would advance my former inquiry; Whether the various Compreſſions, Strainings, and Colliſions, together with the changes of Heat and Cold, with other unknown Steames, may not ſo far alter the Contexture, and the minuteſt Particles of ſome waters, as to render *them effectually Sanative, whilſt they retain the force of their efferveſcence; and ſoon after to leave them impotent.*

We ſee, what a ſmoaky vapour aſcends from the pureſt Fountaines in Winter, and in the cool Mornings of the Hot Summer: And, though we dare not call theſe Waters hot, or more than relatively tepid, yet the Water being leſs cold whilſt it is ſalient, ſo long it may be enlarged in Bulk, and hold no longer in the ſame Quantity. And Heat and Cold, and, if there be any other Ætherial Concomitants, (tho but as tenuious as Magnetiſmes,) may paſs through Sealed Veſſels: Some perhaps more eaſily through ſome kinds of Veſſels than through others; as Light, and the thinneſt Flames of Fire: Though Air be commonly the Fuel and Bellowes, and ſometimes the Vehicle, yet they paſs through Glaſs, where *Air* cannot paſs; But they paſs not through ſome ſorts of Earthen Veſſels. And (to inſiſt no longer on words than a ſwift glaunce upon the By) we uſe to call them *turgid Spirits* and *rough Spirits*, which are ſometimes nothing elſe but a Heat or Cold encentred in the minute Particles of the Liquor; or thoſe Particles broken into ſharper Figures; Or that ſome Air, which hath a far more vigorous Spring than water, is encentred, compreſſed, and active in or among the parts of Liquor; Or that ſome part of the Liquor is refined into a more Spiritual and Inviſible ſubſtance. And that ſome of theſe caſes, or the like, may fall out in ſubterranean Streams, and other Liquors, I can demonſtrate Experimentally. And then the effect may be this, that the Air, or other Spirits, may be divided in the ſealed Veſſel from the Water; Or the fervid and tumultuous Spirits may ſlacken their Springs, or expire; and ſo the water may grow Languid and ineffectual, either without the falling down of any ſediment, or together with it. That theſe caſes do ſometimes come to paſs, I ſhall now endeavour to prove.

1. Though the particles of water are ſo minute, that we cannot diſcern them with our Eyes, yet by a duller Organ of Senſe, even by Feeling, we may diſtinguiſh the acute and vigorous particles of Healing Waters, from the Languid and hurtful particles of Common waters. The Healing waters will intermingle with their *aſperity's* ſuch an agreable titillation, as will invite us to rub in, or preſſe on the cleanſing and terſive water; And will, all along, recompence the pain of ſearching the wound by their active frictions, with ſuch ſpeedy reparations, and ſuch indulgent degrees of ſanation, as mitigates the Torment with ſtore and variety of pleaſures. Other Common waters, even thoſe of ſome of the pureſt and moſt Chryſtalline Fountains, are almoſt poy-

ſonous; encreaſing Teters and tormenting Ulcers, with an inward and ſullen painfulneſs. This dextrous water, by a moſt favourable Chirurgery, ſearches to the bottom of Old and cancerous Ulcers; ſweeps or ſhaves away the Rootes of Teters and Cancers; and appeaſeth the unnatural rage: And ſome of theſe Healing waters are benigne, whether we apply them outwardly, or truſt them inwardly for the relief of our Entrals and Vitals. And by theſe *remarkable Indications*, and the Effects I have ſeen ſucceeding, I have been confirmed of the real vertue of ſome of the (ſo call'd) *Holy-Wells* of oldeſt reputation in *England*; and have diſcovered other Healing-Springs, whoſe Vertues were not much known, or noted before.

2. And we call in the Teſtimony of the Guſt (which is another of the leſs *ſpiritual* Senſes) to prove the *aſperous*, and yet *appeaſing Particles* in ſome Liquors. *Ligon*, a Gentleman of a curious palate, and Muſical, eſteems the *Queen-Pine* to be incomparably the moſt delicious fruit in the world, and thus deſcribes it: *When we firſt bite it, it is ſo violently ſharpe, as one would think, it would fetch all the skin off the Mouth; but before the tongue can make a ſecond trial upon the palate, as perfectly cures that vigorous ſharpeneſs: And between thoſe extreams of ſharpe and ſweet lyes the reliſh and flavour of all fruits that are excellent: And thoſe taſts will change and flow ſo faſt upon the palate, as Phanſy can hardly keep way with them; and this at leaſt to the tenth examination; for ſo long the Echo laſts.* Thus he: And he ſeems to have in his thoughts an expert Luteniſt, when he briskly ſweetens Diſcords into the livelieſt Harmony. I dare not take the boldneſs here to think on the warbling of a Lute. But, to impreſs the Advertiſement concerning the difference of theſe waters, I abide the longer on the Deſcription: And I durſt not ſay it, if I had not felt my ſelf oftimes, and alſo heard it acknowledged by them that received wonderful benefit from thoſe kind Springs. Therefore I perſiſt thus far in the Parallel; As the Juyce of the delicious fruit playes upon the Organs of Taſt, ſo doth the right Healing water upon the Ulcers: At firſt touch it ſeems to tear the fleſh off deeper, but immediately changes the begining of a deep pain into a deeper pleaſure: And after many aſſaults, and quick ſlidings, the rugoſities of the wounds

or of the Liquor, or of both, are by their dauncing vibrations ſmooth'd into a delightful accord. But let us accept of Vulgarities for the moſt evident Inſtruction in like caſes: When Wine, Cider, or Ale is well botl'd, we feel how auſterely it invades the roof of our mouths and our throats at firſt, and how ſpeedily it repayes with a gratifying ſatisfaction: Yet, neither Minerals nor their Salts, nor other Ingredients are preſumed to enter into the bottels, *whilſt theſe liquors acquire this livelineſs*. This ſeparation of parts, and the enlargement of the Spirits, or ſome alteration of the conſiſtence of the Liquor, may give the improvement here: And ſome ſuch cauſes may exalt the vigor of thoſe Springs, whilſt they are briskly running, and working their way through the Veins of gravel, ſand, and healing Bolus's; Or perhaps rather from ſubterrranean ſteames, which do alſo impregnate the healing Bolus's with their beſt Vertues.

3. Our Eyes alſo may be, in ſome ſenſe, good witneſſes of peculiar figures in the particles of thoſe Spring waters, which are proper for the Eyes. They ſeem to ſcoure the Eyes, as it were, with ſharpe, but very fine Gravel. And by this indication I have tryed and found the Springs which are extraordinary for the Eyes and perhaps to cleanſe Optick Glaſſes. About 30. years agoe, in a very hot and droughty Summer, there was an Epidemical diſtemper of mens Eyes and Eyelids; I found it ſo at *London* and *Weſtminſter*, and almoſt in every Houſe where I came, as I travell'd weſtward on both ſides *Seavern*: Ver-juyce, of the juyce of Crabs, was found the beſt remedy; and where they knew it not, I gave notice of it; and all that tryed it, confeſſed that it was nor a very unpleaſing application. Their eyes had a fretting itch; and Ver-juice proved more agreable than Vinegar, or White-wine, or any other liquor, or mixture. Some ſuch tickling pleaſure, but yet more delicate and tender, there is in ſome Spring-waters, which are for the eyes peculiar. Of this indication I gave notice in your *Num.* 20. *pag.* 359. And of the former indication of Healing ſprings, I gave you then a hint, but I know not how it was miſcarryed.

4. The Springineſs of wool, more than of Linnen, offers another viſible and tangible Demonſtration, how the ſtronger and quicker Springs of ſome water, more than of other, may

conduce more or leſs to healing; or may be more or leſs noxious, either inwardly taken or outwardly applyed. Upon this occaſion I remember, the Lord *Bacon* ſomewhere, I think, *in Hiſt. Vitæ & Mortis*, takes notice, that anciently, to preſerve Life in dangerous ſickneſſes, they uſed to remove Linnen, and to let the Sick lye next to the woollen blankets. And I have received it well atteſted, that, *in confiniis mortis*, ſome have had ſpeedy relief from a flannen waſtcoate made of the fineſt wool: They prefer the ſcarlet Dye; I think, my Lord names a Tincture of Saffron with Oyl of Almonds, but I dare not truſt my memory, having ſeen it but once, and that was, when it was firſt publiſhed: Such a woollen garment will drive a warm friction through a ſhirt of fine Linnen, which may anſwer in a gentle degree to Friction, as it is one of the laſt Medical applications among the witty *Chinois*; and among other Nations, who adhere ſtifly to their oldeſt, and beſt tryed Experiments. For the Sanative force of Friction I refer to your *Num.* 12. p. 206, where the Lord *Bacon* is recited to obſerve, *that motion and warmth drawes forth into the parts new Juyce and Vigour* (and theſe are the effects of wool, as they are of Friction) and that *Frictions conduce much to Longevity.* For another purpoſe I add an Inſtance of a much differing kind: I knew one who was ſhot in his heel with an arrow, which carryed with it a very ſmall ragg of the woollen ſtocken: This ragg being not found by the Chirurgions, though they were then of the beſt note, the wound became for a year or two incurable; And the pain was ſo intolerable, that it was thought neceſſary to cut off his foot: At laſt by chance the ragg was found, and taken away, and then the cure was ſoon perfected. Woollen and Linnen may have their turns and ſeaſons; the one as a Mechanical Operation for heating by a cloſe and permanent friction, the other as a quiet Lenitive. Our tender skin can hardly bear the inceſſant Springineſs of Wool; In a deep wound we can leſs endure it. But the Springs of ſome waters may be lined with a ſofter Liquor than the hairy and curled filaments of wool: And hence we may perceive, how ſome waters may by their rolling particles be the greateſt Probes, and yet the ſureſt Searchers, Cleanſers, and Healers. And hence alſo, on the contrary, we may ſee, how ſome waters, which cure Ulcers

cers and Cancers by outward application, may be too buſily corroſive and dangerous, if taken inwardly.

5. To approach cloſer to the main point, I ſhould now deſcend to particulars, and take a more exact accompt of ſome ſingular Qualities in waters. Credible Authors, both Ancient and Modern, do make very ſtrange reports of ſome Fountains and Lakes: And you have given us conſiderable Narratives of the Boyſterous Spring in *Weſtphalia*, and of the Salt Springs in *Germany*, N. 7. Of the Springs in *Paderborn*, *Baſel*, and in *Alſatia*, N. 8. And lately N. 54. of the Lake in *Carniola*: But I muſt not now purſue wonders; I ought here to apply to the point, with ſome diverſions for general uſefulneſs and property, for our own Country. Salt is a part of our food; it ſeaſons all things and (if rightly ordered) aſſiſts Fertility. And *Healing* waters have ſomewhat of the obligingneſs of the divine miracles. And theſe two ſhall be my preſent buſineſs, *Salt* and *Healing* waters;

Parcarumque colos exoratura ſeveras
Flumina: ſaid the Gentile Poet *Claudian*.

6. I think I may note, that generally all the Springs in *England*, that are of very Ancient eſteem for Healing, and were commonly call'd *Holy-wells*; ſuch as St. *Winefrids-well* in *Flint-ſhire* (of which I never made tryal, but it carries the greateſt Fame,) are all very pure, and yield no kind of ſediment. In this, our hot Baths, and perhaps ſome few Mineral Springs, are to be excepted. I muſt yet be more particular.

7. I know a Spring, which the old People there call their *Holy-well*, on the ſide of a low Hill in an Arable Field; which (beſides the Healing Qualities) hath an extraordinary efficacy in clearing the skin from Sun-burnings and freckles; and addeth as much luſtre, as agrees with the finer Art of concealing Art, and with modeſty; And, after waſhing two or three mornings, it makes the skin as ſmooth as Glaſs. It paſſeth through a vein of light Sand, if I may call it Sand; 'Tis more like to ſome kind of blewiſh criſped Marle; 'tis ſo light and hollow, as if it were freſhly working by ſome ferment; and 'tis ſo full of very ſmall and thin *Laminæ*, ſeeming to be Metalline, and bright like the pureſt Silver, that it encouraged me, about 12 years agoe,

goe,

ago, to ſend ſome of it to the Lord *Brereton*, who was pleaſed to ſhew it to the Refiners, but they could not find it to be of any value. I was inquiſitive to ſearch it out, whether this water had the beautifying property from the Silver-like *Laminæ*, or rather gave thoſe veins of Earth that tincture and ferment. Only two things I can affirm; 1. I ſaw many Springs opened in the lower Grounds; and which ſeemed in all appearance to run from the ſame Head, and had alſo the very ſame bright ferment in their paſſages, where they were opened; but theſe had nothing of the ſame property for Healing, or for Beautifying, as I found by many tryals, more than daily for ſome years together. 2. The common Fields adjoyning, had on their clods and Fallowes, ſomewhat of the ſame glittering, much faded, but enough to dazle their Eyes that fixed on it in a bright Sunſhining. May not ſome Subterranean ſteam give the tincture, both to that vein of Earth, through which it paſſed more freely; and alſo more forcibly to that Spring by a greater reſort, or by ſome advantage it got by the aſcent of the Ground? (And we commonly find theſe healing Springs, either near the top, or on the ſide, or near the foot of ſome Hill, or running from the Hill:) And thus the ſteams reverberated and daſhed down by the Motion of the Air, and by the weight of the Atmoſphere, may beget the ſame Metalline tincture in the adjacent Fields. *This* was far enough from yielding ſediment, and it had a pleaſing ſmoothneſs; and was very inoffenſive to the ſtomach; but it ſearched the Eyes ſomewhat ſmartly, and cleared them ſpeedily, and was generally commended for many healings, both inwardly, and outwardly; And was every way much more pleaſing than tormenting. The Villagers, to whom the Spring belongs, being conſtantly healthful, and having other affairs than to beautify their skin, they take the leſs notice of it; but if it were in Hide-Park, or More-fields, it might be valued above the richeſt Canary.

8. Within two Miles of the ſame, is another of their old *Holy-wells*, on the brow of ſuch another Hill in an Arable Field, within half a Mile of a lofty Hill: This is very kind for the Eyes, and hath alſo done many cures upon putrid and fœtid Ulcers, which were many years deplored for incurable, as I can affirm upon my own knowledg: I have ſeen it tryed often, and alwayes to good

effect; ſometimes conſiderably wonderful. This is the ſame Spring, which I meant in my *Numb.* 20. near the end of p. 358. where by ſome miſtake of my hand (for it was then very bad) it is not diſtinguiſhed from the other Springs there mentioned, or intended. Many drink of it, and much extol it for healings: And I never could heare of any that complained of hurt done by it. It was ſomewhat aſperous, but pleaſing in malignant vlcers.

9. But much greater is the reputation of the *Holy-Wells*, as they call them, on the ſide of *Malvern* Hills, which Hills divide *Worceſtire*-ſhire from *Hereford*-ſhire. The higher Spring is peculiar for the Eyes; *About a furlong lower is the Healing Spring* (which laſt halfe line was omitted in the Print of your *Numb.* 20. p. 358, l. 22;) this cureth many Maladies and Cancers, if applyed before the ſtrength of Nature be overthrown. I have read in the Monuments belonging to the Hoſpital at *Ledburg*, a Town in the way from *Hereford* to thoſe Springs, that a Biſhop, ſome Ages paſt, endowed that Hoſpital with revenues, for the entertainment of diſtreſſed Paſſengers that travayled to thoſe Springs for relief. 'Tis above 50 years ſince I heard a Panic ſtory ſpread all over the City and Country of *Worceſter*, that the Phyſicians had poyſoned thoſe Wells. I am perſwaded, that the ground of this Fable was only thus: After more than ordinary Rain for one, two, or three years together (as it falls out ſometimes in *England*) ſome common waters, by a part of the ſame, or ſome other channel, do drive to the ſame apperture, and drown the excellency of the healing Water. In this droughty year we find, that many excellent Springs have loſt more than half, and ſome more than four parts of five of the waters which they did uſually afford in the ſame ſeaſons of other moyſter years; and the remaining waters have the ſtronger efficacy. Of this expectation from long Droughts I adverts'd you *N.* 20. p. 358. And 'tis *now remarkable*, that theſe better Springs, which are on the ſide of Hills, and on the higher ground, do maintain their current much better, than thoſe which are in the lower Vale. 'Tis ſo in many places about us here; when the better Springs had loſt 4 parts of their current, many of the lower Springs were quite dryed up. This advantage (by the Drought) em-

boldened my preſent adventure, there being now leſs peril, that my Teſtimony can be refuted. But Fooliſh people go ſweating up the Hill, and then drink the cold water; or apply it Cold to their heated Ulcers, and then what good can be expected? And (withal) theſe waters are kindeſt to the Poor and jejune people, who are accuſtomed to drinks almoſt as weak as water. So the Air in *Bermudas*, and near *Florida* in *Virginia*, preſerves them that are addicted to a ſimple and Natural Diet, without ſickneſs; and frequently to the Age of an hundred years; whilſt the Wealthy (as perhaps more habitually accuſtomed to Brandy, or ſome high and plentiful Diet) have neither firm health, nor long Life. Thus Mr. *Stafford* in your N. 40. p. 794: And the like is reported of *Braſil* by *Piſo* and *Bontius*. No Salubrity of Air, or Medicine of the pureſt water, can recover health or ſecure long life to them that are exceſſively luxurious. All theſe waters are purely limpid, free from all ſediment, very terſive and ſearching, and moſt effectual at the Spring-head.

10. I omit many other Healing waters, that I may give you a brief touch of ſuch Mineral, Saline, and Medical waters, as I have found, or heard of, in our Neighbourhood; Namely about *Yeavil* in *Somerſetſhire*. I lately hear of two more Mettalline Springs in *Dorcetſhire*, beſides that of *Farrington*, analyſed by Dr H. in your N. 56. Perhaps their vertues and their Fame are encreaſed by this drought. The Saline Spring there mentioned by Dr H. to be at *Eaſt-Chenock*, is about 3. miles hence Weſtward. In a very Droughty Summer I found it ſtrong Brine. But there is a Salt-Spring of far greater worth at *Everich*, about 12 miles hence towards *Shepton-Mallet*: of this I will owe you a concernment. The Pool, which yieldeth the Vitriolate Salt, which I ſent you, is in *Sock-Denis*, 3 or 4 Miles hence weſtward. 'Tis not a great Pool, not above 10. foot ſquare. Whether the Salt proceeded from a Spring, or from a vein of vitriolate Earth, I cannot yet determine; the Pool having not been drayned ſince I extracted the Salt, though I expected it, when I gave you the notice, recorded in your N. 18. p. 323. The Mud and Earth about it is as blew as any Roman Vitriol. In a long-laſting and hard Froſt, I ſent for a Quart-Bottle of the water, and found it very thick, and blackiſh, and it ſen-

ted intolerably ſtrong, not much unlike Gunpowder newly inflamed. Cloſe adjoyning unto this Town of *Yeavil*, were two Springs kind for the Eyes; the one in a *Paſture*, the other within a Bolt-ſhoot in a Field. The Old *People* prefer that in the *Paſture* before the other, as they have it from Elder Tradition, and their pretended experience: And at this time, the more commended Spring, which is in the Paſture, and on the ſide of a riſing Ground runs freely; the other is newly dryed up. 'Tis not every ſlight Gravelling of the Eyes that ſufficiently Indicates an extraordinary Eye-water: Many good Springs have a degree of Terſiveneſs; but that which is extraordinary, hath a Friction ſomewhat permanent, and is in the end gratifying. We have alſo, cloſe by our Town, a Spring called *Ruſty-well*. Where it breaks out, and where it firſt falls, it tingeth the ſtones of the Colour of Ruſty-Iron, and it hath the ſmell ſtrongly, (and ſeemeth to taſt) of Ruſty-Iron. Yet 'tis as clear as any water; and I tryed it for a Moneth or more in my ſtudy, putting Corniſh-ſlate and Pebles to it in a Glaſs; and it gave no tincture at all to the ſtones, nor any ſediment; So that I ſuſpect the tincture to proceed from ſome *Effluvium* mingled with the water at firſt opening: But I confide not much in the ſingle and ſhort tryal I made. Some Old men boaſt of many great cures it hath done. I dare ſay nothing for it, or againſt it: Neither do I know, whether I ſhould call it Metalline, or Anti-Metalline, ſince Ruſt is the *Putrefaction* and deſtruction of Iron. Our Fore-Fathers, and very Old men, ſcarce heard of the name of the *Scorbute*: 'Tis a ſeaſonable providence, if, ſince that diſeaſe is become ſo *Epidemical*, the remedy ſhould be ſo Obvious and Vulgar, as is pretended to be, by ſuch ferrugineous Springs. This breaks out near the foot of a lofty hill, which continues, with ſome leſſer falls, about 3 miles weſtward to *Hamden Quarre*, where they dig a hard free ſtone of a dark yellow colour. At *Weſt-Camel*, five miles hence Northward, is a very fætid black Spring, which tingeth Silver black immediately; and I am told, that about 10 miles hence, more Eaſtward, near *Wine-Caunton*, not many years agoe, they digged for Cole, where the Colemen were endangered by a fætid damp; And when they aſſayed the Cole in the fire, it proved very noyſom, ſo that they forſook thoſe Cole mines, Perhaps it may be ſerviceable to them that know how to make an honeſt uſe of Arſenic and other poyſons,

11. Here again, with ſome timorouſneſs, I propoſe the Inquiry, whether Subterraneous ſteames might not give the dark yellow tincture to the *Hamden Quarre*, and the property to this water of *Ruſty well* for the fulvous coloration: It cannot be expected, that Materials, differing ſomuch as ſtones ſeem to differ from water, when perfectly petrifyed, ſhould retain the very ſame Colour, though both received it from the very ſame ſteames. The ſame I propoſe for the blackneſs and fœtidneſs of the Spring in *Weſt-Camel*, and of the Cole near *Wine-Caunton*; that both may receive the ſame tincture, and odour from Subterranean ſteames, which may perhaps be of ſo many kinds, and mixtures, as to cauſe much of the great diverſities of Metals, Minerals, Earths, and Soyles; and of ſome minute differences in the Colour, Taſt, Odour, and dreſs of Vegetables; Yea and of the Furres, Hayres, Wool, and other little varietyes in Animals (particularly in ſheep) in *ſeveral places*; more immediately in Vegetables, and of Animals by remoter circumſtances, I will not except the *Ethiopick hue*, and humors of men in diſtant Climates; though Vegetables and Animals do (for the moſt part) retain their ſeminal properties in diſtant Climates for many generations: and perhaps from theſe terreſtrial ſteams the Vegetables do imperceptibly draw ſome of their Salts, and much of their nutriment. Theſe things I dare not affirm, nor ſay much more, till I ſee fit time and place to offer my reaſons and other Obſervations.

12. For theſe Overtures I will at preſent inſtance no more than thus. The Illuſtrious Mr *Boyle* hath, methinks, evinced, that the moſt ſolid Bodyes we know, have their Atmoſpheres of ſteams and Exhalations: And whatever the Materials be, which are under our Terrene cruſt towards the Centre, whether fluid, flaming, or groſs Subſtances, they muſt needs hold an Intercourſe of tranſpirations, and mutually operate by their perpetual agitations, and whirlings about: And by the *Vulcano's*, frequent in *Japan*, and to be ſeen in ſeveral other places, and by the heats in deepeſt Mines, and by many other ma-

nifeſt Arguments, it appears, that there are alwayes ſtrong ſteams aſcending towards the ſurface of the Earth: And, if their Generative power, and other efficacyes were duely examined, and proſecuted to the beſt purpoſes, we might perhaps in time find them to have a greater vertue, and more uſeful for us, than many of the Conſtellations and Celeſtial Influences, which make no ſmall noyſe amongſt Aſtrologers.

Of *theſe*, we are ſure, and they are in many reſpects manageable; But of *thoſe*, which are ſo far above our reach, learned men are to this day, after ſerious Diſquiſitions, at a demur, whether they concern us at all, or not. We do not compare with the Solar Influence, which doth almoſt all that we ſee done in Nature; And more perhaps than we have hitherto conſidered, as hereafter I may propoſe to you. Next to this, nothing is more frequent amongſt the Ancient, than Obſervations upon the Lunar Influences; Many more, than are ſufficiently confirmd by later phanſied experience. *'Tis phancied* that ſhee is Queen of the wateriſh, Cooling, and Feminine Regions: But tis certain, that the Sun is the Maſculine Lord, not only over the fiery and dry Regions, but alſo over the Moon and all her Dominions. And yet tis ſomewhat ſtrange, that the ſtrongeſt Solar Beames ſhould be ſo totally drencht and quencht in the disk of the Moon, that by all our contrivances of the niceſt Thermometers, and beſt burning Inſtruments, we can have no perception of any degree of Heat; not in the brighteſt and fulleſt Rayes of the Sun, reflected to us by the Moon, though we can hardly Imagine Light it ſelf to be any other thing than the pureſt Flames of Fire. Hence I wiſh a ſevere attention on both hands both to Terreſtrial Steames, and to Celeſtial Influences, (as the manner now is) impartially, without foreſtalment, or prejudice. I have in my aim, though not in my preſent power ſome expedients, which under one may be accomodable to both Intentions. For theſe two Conſiderations, the one in the higheſt eſteem among the Ancient; and the other ſeeming moſt Improveable by modern Induſtry, I have been conſtrained to be ſo tedious, as now I have been.

13. But it is full time to ſum up here, what hath been attempted in this Diſcourſe; and to take up the reſult. We have found ſome Mineral Springs, and have not denyed, that they may in their Channels have gathered up Metalline Salts; ſometimes perhaps, where no Metals are yet formed; yea, and where they are never like to be formed, for want of appoſite materials. Alſo, we have not ſeen cauſe to deny, that thoſe Mineral Springs may have acquired, as the lately mentioned Springs have done, ſome other healing properties, beſides thoſe that are from Mineral Vertue: And thence we may allow, that ſome of thoſe finer and unknown Spirits, may, by reſt or other accident, ſoon divide from the water, or dye there, or expire through any ſealed Veſſels. This we muſt grant, that as the particles of all Liquors do more or leſs ſutably agree with the Orifices of the Tongue, and Pallate, and thence beget the delight, or diſlike in the reliſh; ſo the like effect all Liquors have upon our raw fleſh and deep wounds: And ſome Ulcers have need of a more active Friction to clear them, and to extirpate their very roots, and foundations.

Now for the words —— *whatever theſe Spirits be* &c. N. 51. p. 1039. they may have more aſpects, than are taken notice of in the ſagacious reflexions; and the warineſs of ſuch expreſſions may well be excuſed in an Age, that is too apt to entertain malicious ſuſpicions againſt Phyſitians, and Philoſophers; But tis good to be ſilent, or very modeſt in matters which we can neither affirm nor deny upon clear ground; eſpecially when the full debatement cannot be confined within the Sphere of Phyſiology: Therefore *Manum de Tabula.* What is hitherto but timorouſly intimated, may perhaps be more throughly proſecuted in ſome other Eſſays, if this tediouſneſs be forgiven.

Some

Some Obſervations, Directions and Inquiries Concerning the Motion of Sap in Trees, in purſuance of what was formerly begun therein, about the latter end of 1668. and the next following Spring, by Dr Ezerel Tonge, *and* Francis Willoughby *Eſq;*

We ſhall here begin, according to the order of time, with the late Communications of D. Tonge, *which are as follows;*

Now begin my Inquiries and remarks upon the laſt publiſht Obſervations of thoſe Ingenious perſons Mr *Willoughby* and Mr *Wray* in your *Ph. Tranſact.* N. 48. *June* 21. 1669, And *Firſt*, to the 3d and 4th Experiments I propoſe this Inquiry; At what Seaſon of the year, Month, day, and in what wind and weather, Branches and young Trees (eſpecially ſmall Branches) are ſo full of Sap, that, being held perpendicular, they will bleed at both ends, as is there related; and Roots, both wayes? And what gage the Barometers and Thermometers then held? And in what forwardneſs their Buds and Leaves, or Chats were then ſhot, or broken? And of what Diameter ſuch Roots were?

The latter part of the 4th Experiment *appearing* ſo manifeſtly to diſagree with ſome Experiments, I have made this Year, as well as formerly, in Roots and Branches of Trees; whereby I found, that not only Cold weather, but Cold Wind and Sun-ſetting ſtopped or abated the Motion of Sap in the Sycamore: Which puzleth me, how to direct an Inquiry to find out the Cauſe of this ſingular Experiment, and of the Obſervations alſo in the 11th Experiment, which highly confirms this. The beſt directions I can at preſent deviſe, (untill the Experimenters ſhall pleaſe to give us an accompt of the Time, Seaſon, and that not only by the Month, day, hour, but alſo by the wind, and the motions of the weather-glaſs, before, after, and at the inſtant of thoſe Obſervations;) are the enſuing; which we ſhall conclude with ſome other inquiries.

1. What the difference of the Seaſons of that Experiment was from the foregoing? 2. Whether the *Heat* were ſo great, when the Sycamores ſo ſenſibly abated, that it coagulated their Juyce, and, by thickning it into Jelly and ſo into wood, ended the running? And therefore 3. Whether this Experiment of Cold, promoting, and of Heat, ſtopping the bleeding, were not in the later end of their running only, and not in the former? And if ſo, Whether 4. the riſing of Sap be not rather to be attributed to the *Degree* of heat, than the *Abatement* of Heat? 5. Whether the reaſon, that the *Birch* increaſed, when the *Sycamore* abated, be not alſo to be imputed to this, that the Birch runs not ordinarily till *March* (unleſs in a forward ſeaſon) and the Sycamore and leſſer Maple in *January*; and ſo the ſeaſon of the ones Sap, beginning ſooner, doth alſo end ſooner: And whether thereupon it be not obſerved, that the ſeaſon of the Birches Jellying into wood will not commence till a greater heat, as that of *May*; whereas the Maple-Sap probably will condenſe to Jelly and wood in a leſſer heat, as that of *March* going out, or *April* beginning? 6. Whether this be not alſo probably the reaſon of what is obſerved in the 12th Experiment in the ſame N.48. *viz.* the *Sycamores* running more on the *North*, and leſs on the *South*-ſide, contrary to my yeſterdayes Obſervation (*March* 1. $16\frac{69}{70}$,) the Southern branches yet dropping in the afternoon when others ceaſed? 7. Whether the *Birch* alſo in ſuch ſeaſons, after the *Maple* and *Sycamore* ceaſe running, will not bleed more in colder weather, ſuppoſe in the middle or beginning of *May*, or latter end of *April*, and ſo veriſie my Experiment of the *Sycamore* running in hotter, and ſtaying in colder ſeaſons, or in the ſign *Piſces*, the latter end of *February*, and the beginning of *March*; and on the contrary, running in colder and ſtaying in hotter ſeaſons, *viz.* of *Aries* or the latter end of *March* and the beginning of *April*: Or briefly, In what *Signes*, and what weather as to wet and dry chiefly, the *Birch* and *Maple* bleed in hot, and ſtay in cold weather, *& vice verſa*? Which temper of weather I would have accurately obſerved by Weather-glaſſes and Barometers. 8. If this be found to verify my Conjecture, then Whether by the running and ſtaying of theſe Trees, and the firſt riſing and ceaſing of their Sap, may not probably (in ſome meaſure, by diligent Obſervation and comparing Ob-

ſervations of time, ſeaſon, weatherglaſſes,) be found the difference of Climats, Land, and Scituation; as alſo of Years forwardly or late fruitful, or of years unfruitful? 9. Whether the Obſervations of *Quality* as well as *Quantity* of Sap by Diſtillations after fermentation, &c may not alſo conduce to the Prognoſtique of the Fruitfulneſs or Barrenneſs of a year, eſpecially in *Walnuts*, and ſuch Fruit-Bearers as yield plenty of Sap, and by analogy and obſervation from them to others: As (*e. g.*) whether a fruitful or unfruitful year of Hazel or Filbert-nuts may not probably be diſcovered by their Scarlet-bloſſoms, not appearing this year till now? (*March* 2.) 10. Whether Ablaqueation (or digging about and baring the roots of Trees) will retard the riſing of Sap in the Walnut *&c.* and what other effect it will have on fruit, &c? And whether ſuch Baring of Roots of Pear, Plum and Cherry-trees (which are as much forwarder than Apples, as Maples are than Birch *&c.*) and generally of all forwarder Trees, ſhould not be made in different ſeaſons (accordingly) from Mulberries and ſuch like? 11. VVhether Amendment of ground, laid after the Sap ceaſeth, be not fruitleſs as to that year, or much leſs beneficial than what is layd before? 12 Whether the ſeaſonableneſs of watering may not be found and promoted by a right Inquiry, and by a due ſatiſfaction to theſe Queries? 13. Whether Ablaqueation, watering, Amendment, &c, according to theſe ſeaſons, may not be ſo directed, as to encreaſe Fruit, Wood, or both, or either at pleaſure? 14. Whether Ablaqueation, which ſo alters the riſing of Sap, that it curdles them, when it ſhould run, doth not hurt? 15, Whether the ſame hath influx on the Leaves, Suckers and outward products of the Tree, or on the inward alſo, as fruit; or only increaſes their quantity, by accident hindring the growth and draught of other parts which did robb the fruit? 16. Whether the Cool ſeaſons of the Night afford not ſome temperament in theſe caſes, ſo that thereby, as tis in cool ſeaſons, the Sap runs and Jellies by day, as it runs by night? 17. Whether in ſome warm days, in which the *Sycamore* runs not at Noon or in the heat of the day, it run in the Night, or the Cool of the day, and, on the contrary, the *Birch* run by day or about Noon, and ceaſe at Night or Sun-ſet, in the ſame ſeaſons? 18. The ſame Queries might alſo be proſecuted in the Hop, which runs after the extream heat of the Summer, after the Hops are ripe and gathered, or any other Plant, that runs in Summer or Autumne, if there be any ſuch.

So far the Inquiſitive Doctor for this time: To which we cannot but ſubjoyn the Letter of that Worthy and Obſerving Gentleman, Mr. VVilloughby, *containing an Anſwer to ſuch of the precedent remarks and Inquiries, as concerned him, and therefore were imparted to him. It runs thus.*

Sir, 'tis no wonder, that Dr *Tonges* Experiments concerning the Bleeding of the *Sycamore* do not agree with ours, they being made in a different ſeaſon; his, in *February*, and ours towards the end of *March*, viz the Cold, which cauſed the Increaſe of the bleeding in the *Sycamore* and *Walnut*, hapned upon the 23. 24. 25. 26. *March*; and one *Sycamore* which ceaſed to bleed from the 12th of the ſame Month, bled afreſh copiouſly from wounds that had been made ſo long before: The Buds before the cold were Juſt ready to open into Leaves, and the Sap had begun to coagulate above a fortnight before. This year, making inciſions in the *Sycamore* and common Maple, in *January*, immediately upon the relenting of the firſt Froſt, we found that they both bled, and faſter, as the weather grew hotter; nor did the ſucceeding Cold promote, but rather hinder their bleeding. So that the Learned Doctor doth moſt ingeniouſly conjecture, that the Aſcent of Sap in Trees depends upon a certain Degree of heat, ſufficient to *raiſe*, but not to *coagulate* their reſpective Juyces. In thoſe Months, wherein the Heat *ordinarily* falls ſhort of that Degree, an accidental heat or warmth of weather promotes the bleeding; but in thoſe Months, wherein the ordinary temper of the Air exceeds that Degree, an extraordinary fit of colder weather makes them bleed again.

The Experiments concerning the *Northern* and *Southern* ſides of Sycamores were made at the ſame time; and are well ſolved by the ſame *Hypotheſis*.

In *Walnut*-trees, we never yet found, that Heat promoted their bleeding, but always Cold. From a wound, made in a *Walnut*-tree, in *January*, and the beginning of this preſent *March*, in mild weather, nothing iſſued; but the weather changing and growing colder, it bled plentifully: Which ſeems not well to conſiſt with that Hypotheſis, and muſt be better examin'd.

Laſt year, the 6th and 7th of *March* we made the Experiments of the Bleeding of Poles (held perpendicular) at both ends, in Willow, Birch, and Sycamore: which may ſo eaſily and certainly be found to ſucceed, in a great latitude both as to the bigneſs of the boughs and temper of the weather, in the beſt Bleeding ſeaſon, that there needs no ſuch exact niceneſs in the Obſervation of thoſe particulars. The 11th of *March*, Roots of Birch, great and ſmall, bled both ways; and about the ſame time, Sycamore roots alſo. Of all which I doubt not, but Dr *Tonge* is by this time fully ſatisfyed by his own Experiments. The ſame Birch, which firſt began to bleed the 3d of *March* this Year, bled 3 weeks ſooner laſt year.

Tryal would be made, whether Cold will diſſolve the Sap already coagulated: Elſe it will be hard, in the Doctors Hypotheſis, to give an accompt of the Trees dropping a new in Cold weather.

It was laſt Autumne obſerv'd by our ingenious Friend Mr *Martin Liſter*, that upon the firſt Froſt, which hapn'd in *November*, a Sycamore bled copiouſly; ſo that the Sap cannot be ſaid to riſe in *January*, but immediately after the Fall of the leaf, in this Tree.

Our Experiments, which you have already printed, are moſt true, and according to the Doctors Hypotheſis, will very well agree with his. His Deductions and Inquiries are very rational and well deſerve to be made publick. Various interruptions have hindred us from the diligent proſecuting of theſe Experiments this *Spring*; which that I may more critically make hereafter, I muſt procure two Sealed Thermometers and two Barometers. I am &c. Dat. Middleton in Warwick-ſhire *March* 12. $16\frac{69}{70}$.

Some Conſiderations

Of Mr. Nic. Mercator, *concerning the Geometrick and direct Method of Signior* Caſſini *for finding the Apogees, Excentricities, and Anomalies of the Planets; as* that *was printed in the* Journal des Scavans *of* Septemb. 2. 1669: *which Conſiderations are here delivered in the* Latine *Tongue, wherein they were written by the Author, as chiefly regarding the Learn'd in Aſtronomy*, viz.

Clariſſimi Caſſini *Methodus*

Inveſtigandi Apogéa, Excentricitates & Anomalias Planetarum, breviter Expoſita & Demonſtrata.

Supponit Cl. *Caſſinus*, ad Planetam in Ellipſi moventem extendi ab utroque foco duas rectas, quarum altera ſit *medii*, altera autem *veri* motûs linea. Conſtructio porrò talis eſt;

Fig. II. L eſt Centrum Concentrici ABCDE.
BLD eſt Diameter.
BA, BC, BP, ſunt intervalla apparentia.
DE, DF, DQ, ſunt intervalla mediorum motuum.
BE, BF, BQ; item DA, DC, DP, ſunt lineæ rectæ.
BE ſecat DA in H; BF ſecat DC in G; BQ ſecat DP in R.
RHG eſt linea recta.
BI eſt perpendicularis ad RHG.
I eſt Centrum Ellipſeos.
LI eſt Excentricitas.
$IO = LI$.
O eſt focus, circa quem ordinatur medius motus; L, circa quem verus.
$IM = IN = LB$.
M eſt Apogéon; N, Perigeon; BLM Anomalia vera.

Demonſtratio.

I. Illuſtriſſimus ac Reverendiſſ. *Sethus Wardus*, quondam in Celeberr. Acad. *Oxon.* Profeſſor Aſtronomiæ Savilianus, nunc Epiſcopus Sariſburienſis, in *Examine Aſtronomiæ Philolaicæ*, edito Oxon. A. 1653. c. 6. docuit Methodum, ex data Anomalia *media* Planetarum, inveſtigandi *veram*; quæ eſt hujuſmodi:

Fig. III. C, eſt Centrum Ellipſeos AEP: F, focus, circa quem ordinatur medius motus. S, focus, circa quem ordinatur verus motus. A, Apogéon. P, Perigeon, E, Erro ſive Planeta. AFE, Anomalia media. ASE, Anomalia vera. FET, linea recta, $ET = SE$. ST eſt linea recta.

In $\triangle$o SFT dantur, 1. SF diſtantia focorum: 2. $FT = FE + ES = AP$. 3. AFT, angulus externus, ſive Anomalia media, æqualis ſummæ angulorum FST & T. Ergo inveniri poteſt FSE, ſive Anomalia vera, æqualis differentiæ Angulorum FST & T. Nimirum

Vt

Ut ſemi-ſumma laterum FT & FS, ad ſemi-differentiam eorundem;
Ita Tangens ſemi-ſummæ angulorum FST & T, ad Tangentem ſemi-differentiæ eorundem.

Sed ſemi-ſumma laterum FT & FS invenitur, ſubſtituendo pro FT æqualem AP, cujus ſemis eſt AC, qui additus CS ſemiſſi ipſius FS, facit Semi-ſummam AS, diſtantiam Planetæ maximam.

Tum, ſi ex ſemi-ſumma AS auferatur latus minus FS, reſtat ſemi-differentia laterum FA, æqualis PS, diſtantiæ Planetæ minimæ; ut ſit

Regula ex Anomalia *Media* data inveniendi *veram*:

Ut AS, diſtantia Planetæ maxima, ad PS, diſtantiam minimam;
Ita Tangens dimidiæ Anomaliæ mediæ, ad Tangentem dimidiæ Anomaliæ veræ.

Corollar. I. Si continuetur SE uſque ad U, ita ut EU ſit = ipſi FE, & tota SU = Axi AP; erit Δ^{i} FSU angulus U ſemis Proſtaphæreſeos FES, ideóque æqualis ſemi-differentiæ angulorum Anomaliæ mediæ & veræ, h.e. ipſorum AFE & ASE; & externus AFU = ſemi-ſummæ eorundem AFE & ASE angulorum, ablata ſcil. ſemi-differentiâ UFE ex majori AFE. Unde oriuntur duæ Analogiæ:

1. Ut Sinus ſemi-ſummæ Anomaliæ mediæ & veræ AFU, ad Sinum ſemi-differentiæ eorundem, U; Ita SU (= axi tranſverſo AP) ad SF, diſtantiam focorum.

2. Ut Sinus ſemi-ſummæ Anomaliæ mediæ & veræ, AFV, ad Sinum Anomaliæ veræ FSU; Ita SU (vel axis AP) ad FU, ſubtenſam Anomaliæ veræ: Ita quoque ſemi-axis AC, ad ſemi-ſubtenſam UX, vel FX.

Corollar. II. Si in eodem Triangulo FSU, ex ſubtenſæ FU puncto medio X, erigatur perpendicularis XE; ſecabit illa SU in duas partes, quarum altera UE = eſt lineæ medii motûs FE, altera verò SE eſt ipſa linea veri motûs.

II. Fig. IV. Sit *a* Centrum Concentrici *cbfi*.
cad, Diameter, eadémque linea Apſidum.
cb, Arcus Anomaliæ veræ, cui reſpondet
di, Arcus Anomaliæ mediæ. Itaque
cdh, eſt Angulus dimidiæ Anomaliæ veræ, &
dci, Angulus dimidiæ Anomaliæ mediæ.
ci & *dh* ſunt lineæ rectæ, ſecantes ſe mutuò in *g*.

Ab Interſectionis puncto *g* demittatur ad *cd* perpendicularis *gb*. Erit igitur,

db.*bg* :: Radius ad tang. *bdg* vel *cdh*.
Et *cb*.*bg* :: Rad. tang. *bcg* vel *dci*.

Ergo $db \times \text{tang.}\, cdh = bg \times \text{Rad.} = cb \times \text{tang.}\, dci$.

Quare $db \,.\, cb :: \text{tang.}\, dci \,.\, \text{tang.}\, cdh$; hoc eſt, db erit ad cb, ut tangens dimidiæ Anomaliæ mediæ ad tangentem dimidiæ Anomaliæ veræ, adeóque (per Regulam ſupra expoſitam) ut diſtantia Planetæ maxima, ad diſtantiam minimam. Quamobrem $db =$ erit diſtantiæ Planetæ maximæ, & cb, minimæ, & ab, excentricitati.

Cúmque idem eodem modo demonſtretur de cæteris omnibus Interſectionum punctis, nimir. Perpendiculares ab ipſis ad cd lineam incidere in punctum b; oportet, ut recta, jungens ipſas Interſectiones, congruat perpendiculari bgf.

III. Ductâ diametro hak, fiat arcus $kl =$ arcui id, & ducantur kc & hl, ſecantes ſe mutuò in p. Ab h in bgf demittatur perpendicularis hr, eadémque parallela Apſidum lineæ cd; erit angulus rhs ſemi-differentia arcuum Anomaliæ veræ ch, & mediæ di. Tum ab eodem h puncto, ducatur recta $h\beta$, faciens cum kh angulum $=$ angulo rhs, & occurrens lineæ Apſidum in β, Erit $\triangle$i $a\beta h$ angulus βah menſura arcûs ch, ſive Anomaliæ veræ, & βha ſemi-differentia Anomaliæ veræ & mediæ (ex Conſtructione;) & externus $c\beta h$ (æqualis duobus internis & oppoſitis βah & βha, adeóque compoſitus ex Anomalia vera & ſemi-differentia ejus à media) erit ſemi-ſumma Anomaliæ veræ & mediæ. Ergo, per *Corollarii* I$^{\text{mi}}$ Analogiam priorem; Vt Sinus $c\beta h$, ad Sinum βha; ita Radius ah, ad Excentricitatem $a\beta$. Sed ſupra demonſtravimus quoque ab æqualem Excentricitati. Ergo punctum β congruit puncto b.

Tum ex b excitetur ipſi hb perpendicularis bt; Aio, hanc continuatam incidere in punctum Interſectionis p. Nam Triangula rhs & bht ſunt ſimilia, ex Conſtructione; quemadmodum & $\triangle$m hpk ſimile eſt $\triangle$o hgi, cùm eidem peripheriæ ch inſiſtentes anguli pkh & gih ſint æquales, nec non æqualibus peripheriis kl & id inſiſtentes anguli phk & ghi æquales; quare & tertius hpk æqualis eſt tertio hgi. Et ex æqualibus phk & ghi ablatis æqualibus bht & rhs, reſtant æquales phb & ghr. Vnde ſic arguo: $srh = tbh$, & $rhs = bht$, Ergo $hsr = htb$; ergò & Complementa horum ad ſemi-circulum ſunt æqualia, nimir. $rsi = btk$; & $sig = tkp$, Ergò & $igs = kpt$, quibus ablatis ex æqualibus igh, & kph, reſtat $hgs = hpt$; & $ghr = phb$, Ergo & $hrg = hbp$. Sed hrg eſt rectus, Ergò & hbp rectus eſt. Cùm verò & hbt rectus ſit ex Conſtructione, erit tb in directum ipſi bp. Cúmque idem eodem modo demonſtretur de quavis alia Interſectione linearum ab h & k ad congruentia Anomaliæ veræ & mediæ puncta ductarum; patet, non modò rectam, jungentem interſectiones, tranſituram per b punctum; ſed & hb, lineam perpendicularem fore ad eandem Jungentem, *q. e. dem.*

Corollarium. Si à quovis puncto Anomaliæ veræ, puta h, ad reſpondens punctum Anomaliæ mediæ i ducatur recta hi; excitata è Centro Excentrici b, ipſi cbd perpendicularis bf ſecabit ipſam hi in s eâ ratione, quam linea *medii* motûs obtinet ad lineam *veri* motûs.

Nam per *Corollarii* I^{mi} Analogiam poſteriorem, hb eſt ſemi-ſubtenſa; Ergò per *Corollarium* II^{um}, perpendicularis erecta ex b, nimir. bt, ſecat diametrum hk in t eâ ratione, qnam linea medii motûs obtinet ad lineam veri motûs. Ergò & rs (ſive bf) ſecat hi lineam eadem ratione in s; propter demonſtratam modò figurarum $tbhkpbh$ & $srhighr$ ſimilitudinem.

Cæterùm ex laudata ſuperiùs Reverendiſſ. *Wardi* Methodo inveniendi primam inæqualitatem, non eſt difficile, alium adhuc modum inveſtigandi Apogéa & Excentricitates, non minùs directum & Geometricum, & Obſervationes *quotvis* admittentem, producere; quem & paucis exponam. Plures modos invenient Aſtrophili in Reverendiſſ. Viri *Aſtronomia Geometrica*, edita *A.* 1656, ad quam eos remitto. Interim

Fig. V. Sint l & d duo foci Ellipſeos; t & u duo puncta *veri* motûs Planetæ; arcus Ellipſeos tu ex l ſpectatur ſub angulo tlu, & ex d, ſub angulo tdu; item diſtantia focorum ld ex t ſpectatur ſub angulo dtl, & ex u, ſub angulo dul: Aio, differentiam angulorum tlu, tdu, æqualem eſſe differentiæ angulorum dtl & dul.

Cùm enim trianguli lux tres anguli ſimul ſumpti æquales ſint trianguli dtx tribus angulis ſimul ſumptis; ſi auferantur utrinque æquales lxu & dxt, reliquorum duorum ſumma $ulx + lux$ erit $=$ ſummæ reliquorum $tdx + dtx$, & ab his æqualibus ſummis ſi auferantur inæquales, v. g. ulx ex priori, & tdx ex poſteriori; reliquorum, lux & dtx, differentia $=$ eſt differentiæ ablatorum ulx & tdx; quod erat propoſitum.

Centro l, intervallo axis tranſverſi mn, deſcribatur Circulus abc; cujus arcus ab rurſus ex l ſpectatur ſub angulo alb, & ex d, ſub angulo adb; item diſtantia focorum ld ex a ſpectatur ſub angulo lad, & ex b, ſub angulo lbd. Ergò rurſus differentia angulorum alb & adb $=$ eſt differentiæ angulorum lad & lbd. Sed per *Coroll. I.* angulus lad ſemis eſt anguli lud, & angulus lbd ſemis anguli ltd. Ergò horum angulorum lad & lbd differentia $=$ eſt ſemi-differentiæ angulornm lud & ltd; ergò & angulorum alb & adb differentia $=$ eſt ſemi-differentiæ angulorum ult & udt, quorum prior eſt intervallum apparens duarum Obſervationum, poſterior autem, intervallum motûs medii. Datâ igitur horum intervallorum differentiâ, datur quoque hujus (*differentiæ*) ſemis, nimir. differentia angulorum alb & adb. Sed alb idem eſt cum ult dato; Ergo datur quoque adb angulus, ſub quo peripheria ab ſpectatur ex d.

Simili modo oſtendetur, differentiam angulorum tly & tdy æqualem eſſe ſummæ angulorum ltd & lyd; nec non differentiam angulorum blc & bdc = eſſe ſummæ angulorum lbd & lcd. Cûmque lbd ſemis ſit ipſius ltd, & lcd ſemis ipſius lyd; erit ſanè ſumma ipſorum lbd & lcd = ſemi-ſummæ angulorum ltd & lyd, hoc eſt, differentia angulorum blc & bdc = erit ſemi-differentiæ angulorum tly & tdy, quorum prior eſt intervallum apparens duarum Obſervationum, poſterior autem, intervallum motûs medii. Quare, datâ horum intervallorum differentiâ, datur quoque hujus ſemis, nimir. differentia angulorum blc & bdc. Sed blc idem eſt cum tly dato; Ergò datur quoque bdc angulus, ſub quo peripheria bc ſpectatur ex d.

Unde liquet, ex datis intervallis Obſervationum mediis & apparentibus, dari angulos, ſub quibus ex d ſpectantur Circuli abc peripheriæ quotvis, interceptæ à lineis veri motûs. Ergò, per *Herigoni Theor. Plan.* l.1. c.3. Prop.12.*Schol.* 1. totidem Circuli ſegmenta deſcribi poſſunt, capacia angulorum, ſub quibus iſti arcus conſpiciuntur ex d, quæ ſegmenta omnia ſe mutuò interſecabunt in d. Poſſunt igitur & hac Methodo inveniri Apogéa & Excentricitates Planetarum, delineatione Geometricâ, adhibitis Obſervationibus *quotvis*; nec difficilius eſt, Circulos ducere, quàm lineas rectas.

Sed ut demus id, quòd verum eſt, Clariſſimi *Caſſini* delinationem Geometricam non-nihil expeditiorem eſſe; verendum eſt interim, ne, ſi ἀκρίβειαν Aſtronomis expetitam ſectemur, Diagrammata requirat enormis magnitudinis, adeóque operoſior evadat, quàm ipſe Calculus. Ad hunc autem accedentes, utramque Methodum æquipollere deprehendemus.

Adhibeamus enim ex Obſervationibus *Tychonicis* tres, quæ Dom. *Caſsini* Diagrammati quodammodo conſentiant; nim. Obſervationem A, cùm *An.* 1604, *Mart.* 28 *d.* 16 *h.* 23 *m.* *Mars* obſervatus fuit in ♎ 18 *g.* 37 *m.* 10 *s.* B, cum *An.* 1587, *Mart.* 6 *d.* 7 *h.* 23 *m.* idem Planeta viſus fuit in ♍ 20 *g.* 43 *m.* 0 *s.* Denique C, cùm *An.* 1600 *Jan.* 18 *d.* 14 *h.* 2 *m.* deprehenderetur in ♌ 8 *g.* 38 *m.* 0 *s.* Eſt igitur inter A & B intervallum apparens 22 *g.* 54 *m.* 10 *s.* & huic reſpondens medium 25 *g.* 58 *m.* 40 *s*; at inter B & C intervallum apparens 47 *g.* 5 *m.* 0 *s.* & medium 56 *g.* 21 *m.* 57 *s.* Itaque

Methodo

Methodo Caſſini, Fig. *II.*

1. In Triangulo DBH,

Dantur	DB	10,00000
	DBH	12|99
	BDH	11|45
Quæritur	BH	9,68106

2. In Triangulo DBG.

Dantur	DB	10,00000
	DBG	28|18
	BDG	23|54
Quær.	BG	9,70653

3. In Triangulo HBG.

Dantur	BH	9,68106
	BG	9,70653
	HBG	41|17
Quær.	BGH	64|95
Cujus Compl.	GBI	25|05
Si auferas ex	GBD	28|18
Reſtat	IBD vel IBL	3|13

4. In Triangulo GBI.

Dantur	BG	9,70653
	GIB	90
	GBI	25|05
Quær.	BI	9,66363

5. In Triangulo IBL.

Dantur	BI	9,66363
	BL (ſemis τȣ BD)	9,69827
	IBL	3|13

Quær. BLI 32|31, An. vera, & LI, 8,67284, Excentricitas.

Methodo Herigoni, Fig. *V*

1. In Triangulo dbh,

Dantur	db	10,00000
	adb externus	24|44
	bhd	11|45
Quær.	bh	10,31894

2. In Triangulo dbg,

Dantur	db	10,00000
	cdb externus	51|72
	bgd	23|54
Quær.	bg	10,29347

3. In Triangulo hbg,

Dantur	bh	10,31894
	bg	10,29347
	hbg	41|17

Quær. hbg (vel hbi) 64|95 $= bsg$

Et $hib = sgb =$ 90.

Ergo $hbi = gbs =$ 25|05

Ex $gbi = gbs + sbi$ $(= hbg - hbi) =$ 16|12

Aufer $dbh = hbi - dbi =$ 12|99

Reſtat $gbs + sbi - hbi + dbi = sbd$ (vel dbl) 3|13

4. In Triangulo gbs

Dantur	bg	10,29347
	bgs	90
	gbs	25|05
Quær.	bs	10,33637

5. In Triangulo dbl,

Dantur	bd	10,00000
	bl (ſemis τȣ bs)	10,0353[illegible]
	dbl	3|13
Quærit.	bld	32|31 Anom. vera
Et	ld	9,00926 Excentricitas.

Nimir. Ut Fig. *II.* BL 9,69897, ad LI, 8,67284;
Ita Fig. *V.* bl 10,03534, ad ld 9,00926.

	s.	g.	m.	ſec.
Ex loco apparenti ſecundæ Obſervationis	5	25	43	0
auferatur angulus Anomaliæ veræ BLI	1	2	18	36
Reſtat locus Apogéi	4	23	24	24

Erat autem reverà ævo *Tychonis* Apogeon *Martis* in ♌ $28\frac{1}{3}$ *d.*, à quo deficit iſte locus, calculo inventus, ſolidis quinque gradibus. Porrò,

Ut B L 9,69897, ⎫ Ita 5,18290 Log-us 152369 diſtantiæ med. ♂tis,
ad L I 8,67284; ⎭ ad 4,15677 Log-um 14347 Excentricitatis ♂tis.

Eſt autum vera Excentric. ♂tis 14179, quam iſta, calculo inventa, excedit $\frac{168}{14179}$ particulis.

Cæterùm in ratiocinio ſecundùm utramque Methodum inſtituto notare licet non modò perpetuam Triangulorum ſimilitudinem, ſed & Epilogiſmi congruentiam; ne quis Apogéi & Excentricitatis ſic inventæ à vero diſcrepantiam cenſeat errori Calculi imputandam. Sed nec Obſervationum vitio contingit; quas in dubium vocare nil aliud foret, quàm principia in Aſtronomia negare. Itaque reſtat, ut Hypotheſin excutiamus.

Et *Elliptica* quidem Orbitæ Inventio ſine controverſia *Keplero* debetur; ſed quibus Accelerationis & Retardationis gradibus incedant Planetæ, definire, non minùs pertinet ad integrandam Hypotheſin, quàm ipſius Orbitæ determinatio. Quanquam autem ex Cl. *Caſſini* (vel Interpretis ejus) ſermone id nuſquam apparet; attamen ex Conſtructione Problematis, & ejus Analyſi, manifeſtum eſt, eum ſupponere, Planetam ex foco ſuperiori videri prorſus æquabili motu incedere. Fuit ſanè, cùm idem exiſtimaret *Keplerus*, quod ejus Scripta evolventibus liquere poteſt. Sed cum id Obſervationibus nequaquam congruere animadverteret, mutavit ſententiam, & lineam veri motûs Planetæ æqualibus temporibus æquales areas Ellipticas verrere profeſſus eſt: Punctum autem, ex quo Planeta exactè æquabili motu procedere videtur, nullum omninò extare in hoc Univerſo, niſi id libratile ſtatuere libeat. Nulli interim puncto propriùs æquabilem videri inceſſum Planetæ, quàm ipſi foco ſuperiori Ellipſeos. Neque inventus fuit hactenus, qui areas *Kepleri* phænomenis ſatisfacere poſſe negaret; ſed, cùm eas Calculo directo exhibere nec ipſe nec poſt eum quiſquam potuerit, cauſati ſunt nonnulli, *Keplerum*, nimis indulgentem cauſis *Phyſicis*, à *Geometria* diverſum abiiſſe; quaſi cauſæ phyſicæ repugnent Geometriæ, aut minus Geometricum ſit Problema, quod, nullâ injectâ phyſicarum cauſarum mentione, ſic proponitur: *Data area Trilinei; inter lineas abſidum, & veri motus, nec non peripheriam Ellipticam intercepti, invenire Angulum ad Solem.* Habent igitur à *Keplero* reſponſum, qui illi ἀγεωμετρίαν objiciunt; nim. *Eant ipſi & Schema ſolvant.*

Quamvis autem religio fuerit *Keplero*, ab Hypotheſi, quam *Naturalem* eſſe planè perſuaſum habebat, recedere; quidni liberum foret aliis periculum facere, num via quævis alia detur, inæqualitatem Planetarum primam directo Calculo inveſtigandi? Ideoque Vir Clariſſ. *Iſm. Bullialdus* aggreſſus eſt ratiocinio Geometrico indagare, quâ ſemitâ, & quibus intenſionis ac remiſſionis gradibus conveniret Planetas ferri, ut ab æquabili inceſſûs norma, Aſtronomis ante *Keplerum* aſſumptâ, ad eam, quam ſpectamus, Inæqualitatem perduceremur. Perennant Illuſtriſſimi viri monumenta, unde omnem hujus Inventi rationem haurire licet Aſtrophilis. Amplexus eandem Reverendiſs. *Seth. Wardus*, primùm oſtendit, paria facere cum linea æquabilis motûs circa alterum Ellipſeos umbilicum gyrata; deinde & Calculi directi methodo ornavit eâ, quam paulò antè recitavimus: Ita ut nil amplius deſiderari poſset, quàm ut *Urania* felicibus cæptis annueret. Cujus quidem nomine ſuſcipere auſus fuit Illuſtriſs. Comes *Paganus*, edito, *biennio poſt*, ejuſdem ferè tenoris Scripto, adeò veram eſſe Hypotheſin, ut deprehenſam circa Octantes diſcrepantiam, Aſtronomorum inſcitiæ tributam mallet. At Cl. *Bullialdus*, audiendam potiùs ipſam Aſtronomiam ratus, Obſervatorum ore loquentem, ſecundis curis, adhibita prioribus Inventis limitatione quadam, diſcrepantiam illam exterminavit. Unde porrò intelligitur, Hypotheſin illam, cui Cl. *Caſſinus* inveſtigationem Apogeorum & Excentricitatum ſuperſtruit, tantundem ferè deficere à vero, quantum Cl. *Bullialdi* limitatio pollet, atque ab illo defectu pullulare eum quem ſuprà notavimus, Calculi à Cœlo diſſenſum.

Tantùm vero abeſt, ut de Eximii Viri Inventione vel minimum delibatum velim, ut quicquid hujus lucubratiunculæ non hauſi ex Reverendiſſ. *Wardo*, vel *Herigono*, id omne Ipſi libentiſſimè acceptum referam, qui anſam nobis præbuit hæc altius conſiderandi. Nec dubitamus, quin omnia iſta multò uberiùs ac luculentiùs in promiſſo *Tractatu* expoſita propediem reperturi ſimus, cujus Editionem maturam, pro eo qno flagramus diviniſſimæ Scientiæ amore, perquàm avidè exſpectamus.

An Account of Three Books.

I. Eſperienze *intorno alla* Generatione Degl' Inſetti, *fatte da* Franciſco Redi, *Academico della Cruſca. In* Firenze, *A.* 1668. *in* 4o.

THe Learned and Ingenious Author of this Book, lately come to the Publiſhers hands, though not yet (which is much diſliked by the curious) into our Stationers Shops, doth with much induſtry undertake therein to evince, that there is no ſuch thing as *Æquivocal* Generation, but that every Animal is generated by the ſeed of another Animal, (its parent,) or, at leaſt, from ſome Living and un-corrupted *Plant*, as out of Oak-Apples, and ſeveral Protuberances and Excreſcencies of Vegetables.

Firſt then, in the aſſerting of the *Univerſal* and true Generation of Inſects by a peculiar and paternal Seed, the Author poſitively affirms, that he could never find, by all the Experiments and Obſervations, he ever made (of which he relateth a great number, by himſelf made upon all ſorts of Animals) that ever any Inſects were bred from Fleſh, or Fiſh, or *putrified* Plants, or any other Bodies, but ſuch, as Flies had acceſs unto, and ſcatter'd their ſeed upon; he having taken extraordinary care and pains to obſerve, that alwayes on the Fleſh, before it did verminate, there ſate Flies of the ſelf ſame kind with thoſe, that were afterwards produc'd thence; and again, that no Worms would ever come from any Fleſh in Veſſels well cover'd, and defended from the acceſs of Flies; ſo that to him there is no generation of Inſects from any dead Animals, but ſuch as have been fly-blown.

And leaſt it ſhould be objected, that the reaſon, why in veſſels exactly cloſ'd, no Inſect breeds, is the want of Air, neceſſary to all Generation, He hath carefully covered ſeveral veſſels with very fine Naples-vaile, for the Air to enter, though Flyes could not; but that no worms at all were bred there, notwithſtanding that many Flyes ſwarmed about them, invited by the ſmel of the Fleſh incloſed therein.

Secondly, to make out the other part of his Poſition. *viz.* That thoſe Animals that are not bred by the ſeed of other Animals, are produced from ſome live Plant, or its

Excreſcence; This Author eſteems it not abſurd to affirme, that that *Anima* or Power, which is able to produce Flowers and Fruits in living Plants, may be alike capable to breed Worms in them; ſince that Soul is ſo powerful, as to cauſe Plants to feed, to grow and to produce ſeed, as it doth in Animals. For confirmation of which, he obſerveth, that both the generation of Worms in Vegetables is always and conſtantly the ſame (not at all caſual,) and that all *Galls* grow conſtantly in one determinat part of the branches, and always in the new branches; as alſo, that thoſe little Galls, which grow on the leaves of the Oak Holm *&c.* do all grow conſtantly on the fibres or ſtrings of thoſe leaves, not one of them being ſeen to grow on the ſmooth part betwixt two ſtrings: Farther, that there are found many leaves of other trees, on which grow Veſicles, or ſmall baggs, or ſome wrinkled or ſwell'd places, full of worms, ſpringing forth with thoſe leaves. Beſides, that there is not one Gall, but it hath its proper worm; and that each ſort of galls hath its peculiar and determinate race of worms and flyes, which never vary: Where he takes notice of the ſingular Art of Nature both in forming the Egg, which is found in the center of Galls, and in preparing its place therin, furniſhing it with many filaments, that paſs from the Gall-aple to the Egg, as ſo many veins and Arteries, ſerving for the formation of the Egg and Worm, and for the nouriſhment requiſite thereto. To which he adds this Obſervation, that, there being certain ſorts of Galls, which breed more worms at a time than one, Nature hath carefully provided and diſtinguiſht places for them, as ſhe doth in thoſe Animals, that are multiparous.

Having eſtabliſht this ground againſt *Æquivocal* generation, he proceeds to particulars, and refutes the opinion of thoſe, that will have Bees to be bred of the putrifyed fleſh of Bullocks; VVaſps, of Aſſes or Mules fleſh; Drones, of Horſes; Scorpions, of buried Crafiſhes, or the herb *Baſilica*, or dead Scorpions: Toads, of Ducks buried in Dung; Mites, of Cheeſe, affirming, that none of theſe Inſects have any ſuch origin mentioned, but that all thoſe ſubſtances have been firſt blown upon by ſome Flye or other.

He interſperſeth through the whole Book many curious and conſiderable Obſervations, relating to this Subject: As, that ſome Flyes are viviparous, others oviparous only, yet not denying, but that the ſame Flyes may ſometimes breed live worms, ſometimes lay eggs, according to the more or leſs heat of the ſeaſon. 2. That Humane bodies breed worms, but not immediately, but by Inſects blowing on them. 3. That Fruit and Herbs, crude or boyled, kept cloſed up, breed no Vermin, but in an open place, do breed ſome. 4. That there are no Animals partly animated, partly yet earthy, nor Animals half animated, and half wood. 5. That worms breed in the Livers of Mutton, and the Heads of Staggs, he having ſeen divers of them in both theſe kinds of Animals, and eſteeming, that the ſoul of the ſuperiour animal was able to breed thoſe inferiour animals. 6. That Lice are bred of Eggs or nits, laid by their Femal-parent; he having diſcerned by a Microſcope ſome nits yet pregnant with young ones, others, emptied of them. 7. That all living Creatures are ſubject to lice or ſome ſuch kind of Vermine; the *Aſſe* not being exempted from them, as *Ariſtotle*, and upon his authority, *Pliny*, *Mouffet* &c. would have it: And that all ſorts of fowle (except *Oſtridges*, in which he never could meet with any Vermin in any ſeaſon,) and fiſh, have each ſort their peculiar lice: Of which he hath repreſented divers of ſeveral ſorts.

N B. The Author promiſes in this Treatiſe a very particular Hiſtory of the various Fruits and Animals, that are generated of Oaks and other Trees.

II. *Pharmacopoeia Regia, ſive Diſpenſatorium Novum locupletatum & abſolutum, cum annexa* Mantiſſa *Spagyrica, & gemino Diſcurſu Apologetico contra* Ott. Tachenium, & Franc. Vernis. *Auth* Joh Zwelfer. M. D. A. 1668. *in folio.*

THe Author of this Volume, after he had publiſht to the World his *Animadverſions* upon the *Pharmacopoeia Auguſtana*, and after that, a *Pharmacopoeia Regia*, and then, an *Appendix* ſuperadded to both, pretends now in this vaſt Work to deliver ſomething compleat of this kind, following the Experiments and Operations made in his Laboratory, by which he affirms to have given us the Compoſitions and Preparation of the choiceſt Medicaments, performed by a genuin and accurat Method, according to the

19. Claſſes of the *Auguſtan Diſpenſatory*, and directing all to the principal parts of the humane Body, and the particular Caſes of Patients, ſo that in almoſt each *Claſſis* there may be found (he Judgeth) precious remedies deſcribed for every ſickneſs, un-common ones, and confirmed by Natural and Medical Reaſons, and Experience itſelf. Where he ingenuouſly cautions his Reader, above all things to examine, by whom Medicins are prepared, and particularly inſtanceth in a Preparation of Antimonium Diaphoreticum, which, though himſelf had uſed it, when duely and by himſelf prepared, with very great ſucceſs againſt the Plague, yet had found almoſt fatal to himſelf; upon occaſion taking it, when prepared by a Pſeudo-Chymiſt.

In the annexed *Mantiſſa* he deſcribes the Medicins, that may be made of all ſorts of Metals; as alſo of Antimony, Vitriol, Sulphur, Niter, and Tartar; among all which (to note that upon the by) he declareth the vertue of *Aurum fulminans* for an excellent *Diaphoretick*; and teacheth, how its fulminating force may be taken away, *viz.* by a little Spirit of Salt powred on it, or by ſome diſtilled Vinegar boyled with it.

Farther, our Author in his *Defence* againſt *Tachenius* (who with ſome ſharpneſs had attacked all his former Writings) makes it his buſineſs, to refute *Tachenius* his way of *Fixing the Volatil Salt of Vipers*, which, it ſeems, he had formerly communicated to him when they friendly converſed together, but, upon tryal, proved falſe: Where our Author takes occaſion to evince it not to be true, that Animals contain none but Volatile Salt, and that Vegetables likewiſe have not a grain of fixt Salt, except it be produced therein by the Fire; both which *Tachenius* ſeems to have aſſerted. To which he adds an examination of the Doctrine of Salts, delivered by the ſaid *Tachenius* in his *Hippocrates Chymicus*, not at all approving, that he confounds the Lixiviats and Alcalyes with the Salts of Minerals and Animals, in that he gives to theſe two latter kinds of Salts one general name of *Alcaly's*: Where many things occur, belonging to the making of Soap, Glaſs, Verdegreaſe; as alſo to the Liquor diſtilled out of *Calx viva*, to Fulminating Gold, the Melting of Metals, the Salt of Tartar, the Generation of the Stone in Animals, the Alcalys and Reſuſcitation of Vegetables; the *Helmontian Ludus*, &c.

Moreover, this Author vindicates himſelf againſt the Notes of one *Franc. Verni* of *Montpelier*, written upon the *Pharmacopoeia Bricii Bauderonii*; publiſht in French A. 1662. at *Lyons*, in 4°. in which Notes the ſaid *Verny* excepts againſt our Author concerning the Preparation of the *Compounded Acid Syrup of Meſue*, and the *Confection of Alkermes*.

In this Work is alſo contained the Third and Enlarged Edition of the Authors *Animadverſions* upon the *Pharmacopoeia Auguſtana*, and its *Mantiſſa*; wherein, by a genuine and dextrous Method, the Preparations of Simple and Compounded Medicins are ſo delivered, and the Errors of the Ancients in ſuch a manner detected, that from thence, by preſerving and exalting the Vertues of the Simple Medicaments, they ſhall become much fitter means in the Hands of Phyſitians, ſuddenly, ſafely and pleaſantly to remove the diſtempers and Maladies of Humane Bodies.

To all which is alſo annexed his *Spagyrick Appendix*, wherein, what may ſeem in thoſe Animadverſions to be ſomewhat obſcure and imperfect, is pretended to be ſo much farther explained and perfected that it may not only render them farr more clear, but alſo enrich them with divers uncommon Conſiderations and Remedies: Where the *Reader* will meet, among many conſiderable Obſervations, a very neceſſary Caution concerning the *Oriental Bezoar*, of which the Author notes, there muſt needs be innumerable ſophiſticated ones, conſidering the multitude of them, pretended to be true ones, ſeen every where, in all parts and places of the World, whereas yet the Creature, whence 'tis taken, being a Savage Animal, like a kid, is not to be had but by Hunting, and that but in one corner of the *Eaſt-Indies*: Which Conſideration induces our Author to conclude, that moſt of thoſe Stones are factitious, prepared perhaps out of Magiſterics of Alexipharmical Plants, as Scordium, Rue and the like; which may alſo be of good uſe in cauſing ſweat and expelling poyſon.

III. *Affecti-*

III. *Affectionum quæ dicuntur Hyſtericæ & Hypochondriacæ Pathalogia Spaſmodica Vindicata, contra Reſponſion. Epiſtol.* Nathanaelis Highmori *M. D. Cui acceſſere Exercitat. Medico-phyſicæ duæ,* 1. *De Sanguinis Accenſione.* 2. *De Motu Muſculari. Auth.* Tho. Willis *M. D. Nat. Philoſ. Prof.* Oxon, *nec non Med. Coll.* Londini & Soc. Regiæ *Sodalis.* Londini *apud* Jac. Alleſtry *In* 4°.

THe Learned Author of this Book makes it his chief buſineſs therein, to vindicate his Doctrine, which maketh the two Affections, expreſſed in the *Title*, to belong to the *Brain* and the *Nerves*, from the Arguments alledged by the other Learned Phyſitian Dr *Highmore*, who makes the one to be a diſtemper of the Bloud and Lungs, and the other of the Stomach. In the doing of which, our Author *firſt* undertakes to ſhew, by ſeveral conſiderable Arguments, that the affections, called *Hyſterical*, cannot proceed from the Lungs ſtuffed up to a great degree of ſtiffneſs with flatulent Bloud; ſeconding them by ſome Hiſtories and Obſervations, which ſeem very pertinent to his purpoſe: Which done, he proceeds to remove the difficulties and Objections, alledged by Dr *Highmore* in his Epiſtle, formerly printed, and taken notice of in N. 54. of theſe Tranſactions.

Secondly, he endeavors to evince, that the *Hypochondriack* paſſion is wrongfully aſcribed to the *Stomach.* Where he taketh occaſion, *both* to deny to the *Spleen* the office of Warming the Stomach, *and* to aſſert the Fermentative function of the ſame: Teaching withal, that the Acidity is not produced in the ſtomach alone, nor thence only communicated to the Bloud and other humors; and that it proceeds from the fluor of the Salt, and that that Salt is one of the Elements of Natural things; which latter he attempts to make out by Experiments againſt the Objections of his Adverſary.

To this Vindication are annext two *Exercitations*, whereof the *Firſt* is concerned in proving the *Accenſion of the Bloud*: Where the *Author* undertakes to ſhew, that the Bloud being animate, that *Animation* or Life depends from its being kindled, foraſmuch as the proper affections of Fire and Flame belong to the Life of the Bloud; which is here deduced at large; although it be withal acknowledged, that this Vital Flame doth not, as the common Flame, appear to view, in regard that its Form is ſubordinate to another ſuperior *Form*, *viz.* the Corporeal Soul of the *Animal.*

The *ſecond* Diſcourſe treateth of the *Muſcular Motion*, where, having declared, that Dr *Steno* hath been the firſt that hath delivered aright the Structure of Muſcles, and that the Figures deſcribed by him are viſible in them; and alſo made out the motions of their Fibers by divers *Anatomical* Experiments; beſides many other conſiderable particulars: He aſſerts, that the Motion of Muſcles depends from a conſtant Influx both of the Bloud and the *Animal* ſpirits; and that the latter alone, without being aſſociated by the former, cannot perform that moving function; maintaining, that as the Spirits (or Springy particles) in the contraction of a Muſcle ruſh out of the Tendons into the Fleſhy parts of it, and in the relaxation, skip back from theſe into thoſe, ſo thoſe Spirits, lying quiet within the Tendons, do ſwell the Fleſhy fibres by conflicting and ſtrugling there with the particles of Bloud. To which he adds the manner, how the Inſtinct (as he pleaſeth to call it) of performing or ſtopping the Muſcular Motion, is imprinted by the Nerves in the Muſcles: Subjoyning alſo divers important particulars concerning two ſorts of Spaſmes or Convulſions proceeding from the Muſcles, with an illuſtration of the ſame by a very remarkable caſe. All which he concludeth with ſolving the Objections, to which this his Doctrine of the Muſcles may be lyable, and annexing ſome Figures, very lively repreſting ſome Muſcles, together with an Explication of the ſame.

LONDON,
Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, 1670.

Numb. 58.

PHILOSOPHICAL TRANSACTIONS.

April 25. 1670.

The CONTENTS.

An Extract of a Letter from Montauban, *concerning a way of Prolonging Humane Life; together with ſome Obſervations made in thoſe Parts, and a Practice of making a good* Muſcadin-wine, *by means of the mark or husks of that Grape. An Obſervation made in* Rome *this year, touching the preſent Declination of the Needle there,* Weſtward. *Some Anatomical Communications, together with an accompt of two odd Births, from* Venice. *Directions and Inquiries about the Mines, Minerals, Baths,* &c. *of* Hungary, Tranſylvania, Auſtria; *together with the Anſwers thereto. Inquiries about the bleeding of ſome Trees. An Accompt of three Books.* I. *Joh. Sig. Elſholtii CLYSMATICA NOVA, ſive Ratio in venam ſectam medicamenta immittendi.* II. *Nicol. Hobokeni ANATOMIA SECUNDINÆ HUMANÆ.* III. *Joh. Ludov. Ganſii CORALLIORUM HISTORIA.*

AN EXTRACT

Of a Letter written by Monſieur de Martel *of* Montauban *to the Publiſher, concerning a way for the Prolongation of Humane Life, together with ſome Obſervations made in the Southern parts of* France; *Engliſh'd as follows.*

S*IR*, Since you'll have me ſay ſomething to you of my preſent Engagements and Studies, I ſhall tell you, that I retain ſtill my former inclination to Philoſophy, and to ſearch after

Truths, either uſeful to Humane Life, or improving the underſtanding of Man: But by reaſon of many troubleſom Avocations, I cannot apply my ſelf to it but by Fits and Intervals; and I muſt ſtay for a better time, and more favourable opportunities, to comply with my genius. All I can do at preſent, is, to make Reflexions upon ſome Experiments, in the doing of which I find I am more particularly engaged in thoſe, which regard our health; concerning which, I employ much of that time I can redeem from the buſineſs of my Voyages; wherein, when I am alone, I frequently entertain my ſelf with *that* Subject. And in reference to it, I ſhall now declare unto you, under the favour of Philoſophical liberty, and your friendſhip, a thought of mine, much poſſeſſing my mind, but perhaps one of the moſt extravagant in the judgement of the Vulgar.

After I had often reflected upon the general cauſes of Diſeaſes that lead to Death, I mean thoſe of the Debilitation of Nature's ſtrength in the courſe of mans life, until its utter extinction, and of the cauſes of a meerly natural Death, by the failure of that ſtrength in an extreme decrepit Age, without the concurrence of any exceſs or external cauſe; I have entertain'd ſome conjecture, that if we were more intelligent in this matter, than we are, we might procure for our ſelves an Age of continual Youth; ſetting aſide the ſeveral Accidents of Divine Providence, and meerly conſidering the forces of Nature, not only not hinder'd, but alſo aſſiſted as much as may be.

A certain Philoſopher hath formerly been upon the ſame thing, and *Cardan* affirms, that being young, this fancy rolled in his head; and the *Chineſe* ſearch for it with an extreme induſtry; but neither thoſe, that have recorded that of the ancient Philoſopher, nor *Cardan*, have ſaid any thing of the ground of their notion, nor of the way which they thought was to be obſerved for attaining the end thereof. *Ne videar inſanire ſine ratione*, I will tell you, what it is, I have grounded my conjecture upon.

Searching for the true cauſes of old Age, and of natural Death, I was not ſatisfied with that extinction of natural heat and deſiccation of the Radical humour, aſſign'd to be the cauſe thereof, nor with the cauſes of this extinction and deſiccation, that are commonly alledged; it being ſuppoſed, that this hot and moiſt principle of Life, in its own nature diſſipable in the courſe of Life, not being perfectly repaired by food, is conſiderably diminiſht, which brings old Age, and is at laſt quite conſumed, which cauſeth natural Death; where Authors make a great difference between the *Seminal* heat and moiſture, and that which comes from Aliments; ſo that, *ſay they*, the former cannot be repair'd by the latter, as being heterogeneous. Which to me ſeems not to be true; for, doth not this *Seminal* heat and moiſture originally proceed from what is ſuperfluous of the third Concoction of the Aliments? It is therefore of the ſame nature; and nothing hinders, but what is diſſipated thereof may be perfectly reſtor'd by good nouriſhment, well prepar'd, and taken ſeaſonably and in due quantity. Whence it may be juſtly concluded, that the defect of repairing this principle of Life comes not from its nature, not reparable this way, but from ſomething elſe.

The illuſtrious *Bacon*, finding the weakneſs of this ſuppoſition, did conceive, that this fault came from the inequal reparation of the liquid or ſoft, and the dry or more ſolid parts, which jointly ſerve to maintain and repair themſelves; whence it comes to paſs, that the moſt eaſie to repair, and the moſt neceſſary for Life, as the Blood, ceaſe at laſt to be ſufficiently repair'd by the defect of the others, which are not re-

Sanctorius, being almoſt of the ſame ſentiment, holds, that natural Death happens, becauſe the Fibres do ſo dry up, that they can no more be renew'd; he making the maintenance of life to depend from the renovation of the parts. Which doth not ſatiſfie me neither, becauſe even the Bones themſelves, which are the hardeſt parts, are capable of renovation in old Age; in regard that old Oxen, which we often eat, have, at certain times (I ſay not of the Moon, according to the common opinion) their Bones of the ſame place altogether dry and marrow-leſs, and at other times bedewed with a ſubſtance of the nature of marrow, wherewith they are then fill'd, which enlargeth their pores as of a fine Spunge, and ſoftens them; which then eſpecially comes to paſs, after they have fed upon good paſture in the Spring. We muſt therefore inquire into other more true cauſes of old Age and Death, which to me ſeem to be the following.

I ſuppoſe, that the Blood is the principle of life, as far as 'tis vital, that is, in motion by the hot particles contained therein; ſo that thoſe, who expire by Age, do not dye for being deſtitute of blood, which is found abundant and laudable enough in their veſſels, and which hath been ſufficiently repaired till then; but becauſe it ceaſeth to be vital, by reaſon of the too eaſie diſſipation of the igneous particles, which make it ſuch: Which, in my opinion, comes to paſs, as it doth in Wine, which evaporates and loſeth its ſtrength by the fault of the Veſſel, which by ſome opening or other gives paſſage to what gives vertue to the Wine. The Tunicles and Membranes of the Veins and Arteries which incloſe the blood, wear in time away and wax thin, and their Texture gives, and breaks in ſeveral places, at which apertures the igneous particles abandon the blood: As in Stuffs and Cloth (whoſe woof is in a manner like that of the Tunicles) the Threds by wearing do looſen and break, inſomuch that many holes are made in it as in a Sieve. So that, if we had the Art to reinforce and to ſtrengthen anew thoſe Coats and Membranes, that they might not let ſlip what maketh the blood vital, the life would be preſerved perpetually. For a proof of which, this may ſerve for the preſent, that the life of many dying perſons is maintain'd, for ſome time, by making them ſwallow ſome hot and ſpirituous liquor, as ſpirit of Wine, or ſome Eſſence, by which the blood is fortified and quickned for ſome moments: But as this reinforcement of life, conveyed to the heart, and running into the Veins, ſoon ſlips out, ſo alſo this new vigor paſſeth away quickly.

As there is no reaſon to deſpair of finding out ſuch Medicins, or Aliments, as are proper to ſtrengthen the Coats and Membranes of the Veſſels, ſo as they may at all times retain the fiery and ſpirituous corpuſcles of the blood, as well as in the time of Youth; We may alſo hope to be enabled to maintain the blood in a condition alwayes to furniſh alike, as in our vigorous Age, for all the functions of life: The Engine of our body being not unlike to a Chymiſts Furnace, which at firſt well retaining the heat, is very proper for the operations of Art; but at laſt, chinks and crevices being made therein, it ceaſes to be ſo, the heat getting away through them, what fire ſoever you kindle therein.

I ſhall ſay no more of it, the Sequel of what I have ſaid going very far, if it be true. In the mean time, if you think it not contemptible, I ſhall ſend you all what I have meditated upon it, at large, and in the form of a juſt Volume.

Although this Diſcourſe exceeds already the bounds of a Letter, yet to ſatisfie your curioſity, I ſhall add ſome few Obſervations, I have met with in theſe parts.

Firſt, Returning from *Montpeliers*, I went purpoſely to *Frontignac* in the laſt Vintage, to give you an accompt of the manner, how they make their *Muſcadin-Wine.* They let the Grapes grow half dry upon the Vine, and as ſoon as they are gather'd, they tread and preſs them immediately, and Tun up the liquor, without letting it ſtand and work in the Fat, the Lee cauſing its goodneſs. Thus is made the true genuine Muſcadine, without mixing any other ſort of Grape with it. Lately a certain perſon thought fit to paſs White-Wine of another kind upon the mark or husks (which are wont to be caſt away) of the Muſcadine Grapes, and hath made in this manner an excellent Wine, which hath the taſte of Muſcadine, and is more pleaſing to ſome, nor is ſo heady, as the franc or true Muſcadine.

Secondly, Upon the way of *Beziers* to *Narbonne*, in a place pretty large, raiſed by eſtimation above the level of the Sea, (which is two Leagues diſtant from it) about 15 or 16 fathoms, I ſaw Rocks, which incloſed a good number of big Oyſters petrify'd: And upon the ſame way above the place, which is call'd *Nice*, at the higheſt place of the deſcent, very cragged, where the Rock is cut to make a paſſage, is ſeen a Bed, two foot large, of many Cockle-ſhells petrify'd, heap'd up, as ordinarily they are on the Sea-ſhoar; which notes ſufficiently, that the Sea formerly cover'd this place, according to what *Ariſtotle* ſomewhere ſaith, *Ubi nunc eſt Arida, olim Mare fuit.*

Thirdly, We met lately with a Body, which being opened, the Liquor, which is contain'd in the *Pericardium*, or the Bag of the Heart, was found congealed into a conſiſtence fit to be cut with a Knife, and two ſquare fingers thick about the Heart. I know not, whether this Obſervation be rare: But it is time to conclude with the aſſurance of my being, *&c.*

At *Montauban*,
Dec. 4. 1669.

AN OBSERVATION

Of M. Adrian Azout, *a French Philoſopher, made in* Rome *(where he now is) about the beginning of this Year* 1670, *concerning the Declination of the Magnet: Out of an Italian printed Paper, Engliſh'd by the Publiſher, as follows.*

THe *Declination* of the *Load-ſtone* hath for many Years been obſerv'd not to continue alwayes the ſame in the ſame places; and the *Variation* to be ſuch, that it can be no longer imputed to any defect in the Obſervations, as it was believed at firſt, when it was not very great: It hath been noted, ſome Years ſince, that the Magnetick Needle, which almoſt every-where had declin'd *Eaſtward* to 8, 10, and 12 degrees (as may be ſeen in *P. Kircher*, and *P. Riccioli*) after its diminiſhing little by little as far as to the *Meridian*, began to decline *Weſt-ward*.

M. *Adrian Auzout*, a great Searcher of the more conſiderable Effects of Nature, hath made here in *Rome* the following Obſervation about the Declination of the Load-ſtone, on many Meridian lines drawn as exactly as poſſibly he could (in a place, where he hath not all the conveniency for this performance) with a Needle, three quarters of a Palm * long; and on all the lines it was ſeen to decline ſomewhat more than *two* degrees *Weſt-ward*, and on ſome, near *two* degrees and an *half*.

* *This is about ſix Inches.*

And that the Obſervation might be the ſurer, he drew parallel Lines in divers places, to ſee whether there were any Iron or Bricks near the Marble, on which he had deſcribed the Lines, that might have ſome influence upon the Needle;

dle; but he alwayes found the ſame quantity of Declination Weſt-ward.

But by the Obſervations, here made formerly, it appears, that the Needle hath declin'd *Eaſt-ward* to 8 degrees, and hath afterwards been diminiſhing, until 'tis come to the other part, where we find it at preſent. The Obſervations, that may be made hereafter, will ſhew how far the Declination will advance towards the Weſt, and what will happen after its greateſt elongation; it not being probable, it ſhould encreaſe alwayes, and make a whole turn.

It ſeems not, that this difference of *ten* degrees and more can be attributed to the change of the Pole of the Earth, as ſome eſteem'd, perhaps before they knew it was ſo great; nor (as others would have it) to the Magnet, or to the Iron, that are found in certain places, becauſe there is but little Load-ſtone; and Mr. *Auzout* affirms, that the Mines, which he hath ſeen, make no impreſſion at all on the Needle. So that 'tis difficult to hit the true cauſe of ſuch a Variation: Yet however, if the direction of the Magnet, and of the Needle touched by it, depends from the flux of a certain matter, paſſing through the whole Earth, or the exterior parts of it, ſtrait along the *Axis*; it may be ſaid, that it proceeds from changes made in the ſaid flux, which, ſuppoſing the inequalities of the Earth, and the alterations continually made therein, as well artificial, by excavations and ſuch like other works, as Natural, by corroſions cauſed by fire and water, or by the generation of Metta's and Stones (beſides the various changes, we cannot think of by reaſon of the little knowledge we have of ſo vaſt a Body as the Earth) cannot but in progreſs of time change its ſcituation. To illuſtrate this with an Example taken from Rivers; They, although they were running ſtrait, cannot remain long without winding, and changing their courſe, if it happen, that the ground, over which they run, be unequal, or of a different nature. So 'tis probable, that the inequalities of the Earth may in time occaſion ſome bending in the current of this Magnetick matter, and make it change its bed and channel: Whence it comes to paſs, that the Needle changeth its direction according as the Current changeth, which directs it. And if you will conſider the variety of motions, ſeen in Rivers becauſe of the higher or lower grounds, which are found in their Beds, and cauſe various windings and whirlings in them, poſſibly a reaſon may be rendred of the many differences, obſerv'd in the Declination of the Needle (*e. g.* why in ſome parts the Needle varies much in a little time; why, in others, it is alwayes turning without any ſtay, as ſome ſay they have obſerv'd; why the greater alterations are met with at the entring into, and going out of Iſlands?) and of many other things, we for brevities ſake paſs by; as we alſo omit to deduce from it divers particulars relating to Navigation.

Which if it ſhould be ſo, there would be no hopes of finding a regular Hypotheſis for that change, foraſmuch as it would depend from cauſes that have no regularity at all in them, as moſt of the mutations of Nature are. You may only take notice, that if there be a proportion between the force of the ſaid Current, and the Earth, *that* may be able by changing its Bed, remove *this* from its proper ſite: Which would produce an alteration in the height of the Pole, as ſome think they have obſerv'd, if *that* may not be aſcribed to a defect in the Obſervations, of which we may be rendred certain, when more exact ones ſhall have been made. And ſo, whereas others would impute the various Declination of the Magnet to the change of the Pole, we ſhould be obliged to attribute the change of the Pole to the various Declination of the Magnet.

From this Obſervation, which was thought fit to be publiſht here, Mathematicians are invited from time to time to make the like in their Countries, to ſee, whether in this change there be any regularity. If it had been obſerv'd every Year, we ſhould already know the progreſs thereof, and ſee, whether there were an Uniformity, and in what time the Needle did exactly reſpect the Pole. Wherefore it were very deſirable, that for the future, they would uſe greater care and diligence, in making moſt exact Meridians, as well for their own Obſervations, as for the conveniency of thoſe, who in their Travels ſhall have the curioſity of obſerving with the Needle it ſelf, as M. *Auzout* deſigned to do in the Cities where he paſs'd, if he had found Meridians there, or ſuch as had been unſuſpected of the proximity of Iron.

It were well to obſerve, Whether the Declination, which almoſt through all *Europe* hath been *Eaſtward*, be now everywhere *Weſtward?* As alſo, Whether in *America*, where the Declination was almoſt every where *Weſtward*, it be increaſed or no proportionally; and ſo of other parts of the World: Noting withall the Year; which is not at all minded by ſome, who relate the Obſervations, without aſſigning the Year, in regard it will be very uſeful, to know the preſent Declination; and it might be put in Journals, for Navigation, and for the uſe of Magnetick Quadrants.

So far this Relation: In purſuance of which, Order hath been given by the Royal Society, *that preciſe* Meridians *be made in ſeveral places of* England; *for obſerving the preſent Declination of the Needle from them, here in* London, *and other Cities of this Kingdom: And that even thoſe* Meridians, *that were made very exactly many Years ago be examin'd by a careful deſcribing of new ones, to ſee whether they ſtill hold true, in regard of the ſuſpected alterations in Nature.*

If any ſhall inquire after the Manner *of finding the Variation of the Needle, he will find ſeveral wayes of doing it accurately, both by Sea and Land, in* Numb. 24. *of theſe Tracts; where alſo the great uſefulneſs of making exact Obſervations of this kind, is taken notice of; both for the diſcovery of the true Cauſe of the Magnet*'s Verticity, *and for the finding the* Longitude *at Sea.*

An Extract of an Italian Letter

Written from Venice *by Signor* Jacomo Grandi, *to an Acquaintance of his in* London, *concerning ſome Anatomical Obſervations, and two odd Births: Engliſh'd by the Publiſher, as follows.*

Having been honour'd here with the place of Publick Anatomiſt of *Venice*, though I have given as yet but a very ſlender accompt of my performances, in compariſon of the illuſtrious example of *Mundinus*, *Veſlingius*, *Molineta*, *&c.* yet I ſhall acquaint you with ſome particulars that have occurred to me. In my Anatomical Diſſections of the firſt Year, I met with nothing curious, but the *Virſungian* Channel, manifeſtly inſerting it ſelf in the Spleen, and admitting a Silver-ſtiletto; which I had never obſerv'd in any Corps: And then, a Liver divided into five Lobes, together with a Spleen of the figure of a Saw, of extraordinary bigneſs. Laſt year, one drowned of about 35 years of age, had the lacteous veſſels ſo apparent and ſo big, that having ſhewn them how they lay in the body, I ſhew'd them yet the day after, in the Meſentery taken out and diſplay'd upon a Table.

Beſides, I lighted upon two odd Births; one was of Twin-Females, very handſom, but ſo faſtn'd together by the breaſt, that there was not diſcern'd but one only Trunk of the body; which having their Chin united together, ſeem'd to kiſs one another. I could not diſſect them as I would, becauſe they were deliver'd to me to embalm, and the indigent Father of them, who look'd for gain, would not let me have them but for a great Sum of money. Wherefore, not to ſpoil them for the purpoſe deſign'd, having only open'd them upwards from the Navel, which was common to them both, I took out the Inteſtins, the Stomack, the Heart, the Lungs. There was but one Heart, though greater and rounder than ordinary, ſo that Nature ſeem'd to have united the matter of two into one. They had two Lungs, and one Stomack, the *Pylorus* of which did ſtrangely branch it ſelf into two ranks in the Bowels. There was but one Liver, but big; for the reſt, there were two Spleens, four Kidneys, two Wombs, full of a white matter, like a concreted *ſemen*: two *Vulva's*, with their diſtinct *Hymens*. In ſhort, they were ſo well made in all the other Members, that the Painter, who was employ'd to draw them, affirm'd, That if they were done in Ivory, he would have paid any money for them.

The other Monſter was a Boy, terrible to behold, born with his Breaſt open, the Bowels out of the Belly, the Leggs diſtorted, the Bladder in the place of the Fundament; in the Genitals, beſides that the *Teſticuli* were cloſe to the Kidneys, there was nothing but a membranous expanſion, wherein the Spermatick veſſels were loſt. Signor *Steno*, who honour'd me with his viſit, ſaw the adminiſtration of it, which I had before made in the preſence of many Noblemen and Phyſitians at my houſe.

VENICE,

Januar. 25.

1670.

Some Directions and Inquiries with their Anſwers,

Concerning the Mines, Minerals, Baths, &c. of Hungary, Tranſylvania, Auſtria, *and other Countries neighbouring to thoſe.*

T*He Directions and Inquiries, as they were, ſome time ſince, recommended by the Publiſher to the care of the Ingenious and Learn'd Dr.* Edward Brown *(Son to that deſervedly famous Phyſitian Dr.* Thomas Brown, *and Fellow of the* Royal Society*) travelling in* Germany, Hungary, Turky, &c; *are theſe.*

To

To inquire in *Hungary*, *Tranſylvania*, *Auſtria*, and the other Countries thereabout, what is obſervable there, as to Minerals, Springs, Baths, Earths, Quarries, Metals; eſpecially the kinds, qualities, and vertues of Mineral waters? Whether there be any medicated Earths? And what Coals, Salt-Mines, or Salt-Springs, Allom, Vitriol, Sulphur, and Antimony, thoſe parts afford?

To inquire particularly, and to procure ſome of all the ſeveral ſorts of Antimony, and Antimony-Ore, to be found in *Hungary*.

To procure ſome of the beſt *Hungarian* Vitriol, the *Cinnabaris nativa*; as alſo of the true Gold and Silver-Earth or Ore, ſaid to be found at *Cranach* in *Hungary*.

To inquire after, and ſend over ſome of that kind of Vitriol, which by credible perſons is affirmed to be found chryſtallized in *Tranſylvania*.

To get a particular accompt of the Salt-Pits in *Tranſylvania*, which are ſaid to yield two ſorts of perfect Salt, the one being a *Sal Gemmæ*, the other, a common *Table-Salt*. To obſerve, how deep theſe Salt-Mines lie from the ſurface of the ground? How deep they have been digg'd hitherto? What damps are met with in them? *&c.*

To inquire after the veins of Gold and Quick-ſilver at *Cremnitz* in *Hungary*; and after the vein of Silver at *Schemnitz* in the ſame Countrey: And to ſend ſome of the beſt Ores of them all.

Whether in all the Mines of Gold, Silver, Copper, Iron, Lead, in *Hungary*, and the adjacent Countries, and particularly about *Newhauſel*, be every where found Quick ſilver and Sulphur?

Whether it be true, that in the Copper-Mines of that place, which is call'd *Herrn-ground*, be found no Quick-ſilver at all?

Whether it be ſo, that in ſome parts of *Upper Hungary*, the Ores of Copper, Iron, Lead, be ſometimes ſo commixt, that there is often found in the upper part matter of Iron, in the midſt, of Copper, and in the lowermoſt, of Lead? And that in other places, Copperous fluors are mixt with Leaden ones?

Whether the Relation, communicated to the curious *Athan. Kircher* (as may be ſeen in his *Mund. Subterr.*) *viz.* that the ductus's or veins of Metals, do in thoſe parts ſometimes run North and South, ſometimes croſs-wayes, may be relied on?

To inquire into all the Baths of *Baden* and *Hungary*, and the manner of Bathing, uſed there: And particularly, Whether the water of the *Thermæ*, that paſs by *Schemnitz*, depoſe a certain Sediment, which in time turns into a yellow ſtone! And if ſo, to ſend over ſome of it.

Theſe are the Queries; to which we ſhall now ſubjoyn the Anſwers of the above-mention'd curious Travailer, as they were imparted by him at ſeveral times, according as he had occaſion to inform himſelf, when he was in thoſe Parts, about ſuch matters.

—— I have not been unmindful of the Inquiries, you were pleas'd to honour me with upon the accompt of the *Royal Society*; and in Anſwer to them, I ſhall firſt acquaint you with what I found and learn'd of the *Salt-Mines*: concerning which I now preſent you with thoſe two kinds of *Tranſylvanian* Stone-Salts, which you mention'd; and alſo with Salts out of the Mine at *Eperies* in Upper *Hungary*; together with ſome accompt of that Mine.

Of the *Sal Gemmæ* I have ſent you four pieces, and a ſtone of Salt, as it was taken out of the Mine, which, if you pleaſe, for your further ſatisfaction, to break with an Hammer, you will find it to ſplit into Tables or Parallelepipedons in your hand.

With theſe comes along a Specimen of that Mineral Salt, which is commonly uſed at Table. This is found in moſt of the Salt-Mines, as in that of the County of *Maromarus*, nigh to the Caſtle of *Huſt*; and in one at *Des*, in two at *Forda*, in two at *Calos*, in two at *Szick*, and in one at *Dizaknel*.

Great quantity of this Salt is brought down the River *Tibiſcus*, and the Rivers running into it: Some of which is afterwards ſent down the *Danube*, and up the *Morava* to furniſh *Servia*, and the adjacent Provinces; and a great part of it up the *Danube* into *Hungary*; having myſelf ſeen divers Long-boats laden in many places between *Belgrade* and *Presburg*, but they come up no higher; Stone-Salt being prohibited by the Emperour in *Auſtria*, who hath a conſiderable profit upon the boyled Salt brought from *Hall-ſtadt* in that Province.

In my Return from the Mine-Towns in *Hungary*, I met with Count *Rothall* at *Franſchin*, going then from the Emperour to treat with *Abaffi* Prince of *Tranſylvania* his Commiſſioners at *Eperies*: where I engaged ſome of his Attendants, not unknown to me, to make inquiry into the Salt-Mines of that place, or any other, according to the inſtructions I left with them; and afterwards I received an Accompt to this Effect.

Half an hours going from the City *Eperies*, there is a Salt-Mine of great note; from the firſt place of deſcent unto the bottom, it is about One hundred and fourſcore fathoms deep: Into this the Miners deſcend firſt by Ropes, and at laſt by Ladders unto the lower parts. The Mine is for the moſt part in an Earthy, and not a Rocky ground.

The Veins of Salt are large, and there are pieces to be found of Ten thouſand pound weight. They commonly hew out the Salt into Long ſquare pieces of two foot in length, and one in thickneſs; and for uſe, it is broken and grinded between two grind-ſtones.

The Mine is cold and damp; but the Salt being a Stone-Salt, is not eaſily diſſolv'd, or at leaſt in any great quantity, by dampneſs or moiſture: Yet the water of the Mine is impregnated with Salt in ſuch ſort, that being drawn out in large Buckets, and afterwards boyl'd up, it affords a blackiſh Salt, which they give to their Cattle in the Countrey.

The Colour of the ordinary Stone-Salt of this Mine is not very white, but ſomewhat grey; yet being broken and grinded ed to powder, it becomes as white as if it were refin'd: And this Salt conſiſts of pointed parts or foſſets. Another ſort of Salt there is alſo, which conſiſts of Squares and Tables; and a third, to be found of ſomewhat ſtirious or long ſhoots.

Nor is all the Salt of this Mine of one colour, but of divers; that which is found groſly mixt with the Earth, receives ſome colour from it. And even that, which is moſt pure, and reſembleth Chryſtal, doth often receive Tinctures of ſeveral colours. In the middle of a Chryſtal-Salt with long ſhoots, I have ſeen a delicate *blew*; and Count *Rothal* hath a large piece of a fair *yellow*. There are alſo ſome pieces very clear and tranſparent, ſo hard, that they carve them into divers Figures, as Croſſes, Crucifixes, and others. Of each of theſe I have obtain'd a piece, and preſent the ſame unto you *; but cannot omit to advertiſe you, that, whereas theſe Salts, though kept without care, remain'd dry for many months in other Countries, yet they began ſomewhat to relent ſoon after I came into *England*; and if they be kept in a Stove, or very hot place, they will be apt to loſe their Tranſparency. I could not hear of any *Damps* in this Mine.

* *Theſe are now in the Repoſitory of the* Royal Society; *as are alſo the ſeveral Specimens of Ores, hereafter mention'd.*

But to proceed to the Gold and Silver-Mines, I ſhall tell you, as to the *former*, That among the ſeven Mine-Towns in *Hungary* (which are not far from one another, *viz.* *Chremnitz*, *Schemnitz*, *Newſol*, *Koningsberg*, *Bochantz*, *Libeten* and *Tiln*) *Chremnitz* is the richeſt in *Gold*. They have alſo, at preſent, Gold-Mines at *Bochantz* and *Koningsberg*; and they report in that Countrey, that there hath been formerly a rich Gold-Mine at *Glaſ-bitten*, but loſt, ſince that *Bethlem Gabor* over-ran thoſe parts, when the Undertakers ſtopp'd up the Mine, and fled.

They have worked in the Gold-Mine at *Chremnitz* nine hundred years. This Mine is divers Engliſh miles in length, and about One hundred and ſixty fathoms deep. Many veins of the Ore run to the *North*, and to the *Eaſt*. They work alſo towards One, Two and Three of the Clock, as they ſpeak: for the Miners direct themſelves under ground by a Compaſs, not of 32 points (ſuch as is us'd at Sea) but by one of 24; which they divide, as we do the hours of the day, into twice 12. Of the Gold-Ore, ſome is white, ſome black, red, or yellow: that with black ſpots in white is eſteem'd the beſt, as alſo the Ore, which lieth next to the black veins. This Ore is not rich enough to ſuffer any proof in ſmall parcels, like that of other Mines, whereby to know, what proportion of metal is contain'd in it; but they pound a very great quantity thereof, and waſh it in a little River, which runs nigh the Town. The whole River being divided, and admitted into divers cuts, runs over the Ore continually, and ſo waſheth away the earthy parts from the metallin; and from a clear River above the Town, by its running through ſo many works, and over ſo much pounded Ore, it becomes below the Town a dark yellow ſtream, of the colour of the earth of thoſe hills.

There have been pieces of pure Gold found in this Mine; ſome of which I have ſeen in the Emperours Treaſury, and in the Elector of *Saxony*'s Repoſitory; one piece as broad as the palme of my hand, and others leſs, and upon a white ſtone many pieces of pure Gold; but theſe are very rare.

The common yellow Earth of the Countrey near *Chremnitz*, although it be not eſteem'd Ore, affords ſome Gold: And in one place I ſaw a great part of an Hill digg'd away, which hath been caſt into the works, waſh'd and wrought in the ſame manner, as pounded Ore, with conſiderable profit.

Some paſſages in this Mine, cut through the Rock and long diſus'd, have grown up again; and I obſerv'd the ſides of ſome, which had been formerly wide enough to carry their Ore through, to approach each other, ſo as we paſs'd with difficulty. This happens in moiſt places. The paſſages unite not from the top to the bottom, but from one ſide to another.

There is Vitriol in this Mine, white, red, blew and green; and alſo Vitriolat waters. There is a ſubſtance found, which ſticks to the Gold-ore, of ſmall pointed parts like needles, call'd by them Antimony of Gold. There are Chryſtals found here, and ſome tinctur'd yellow,

The Miners will not allow any Quick-ſilver or Brimſtone to have been found here; yet in the lately mention'd Antimony of Gold there is evidently Sulphur, as you'l perceive by burning it. The Quick-ſilver-mine, mention'd in the Anſwer to *Kircher's* Inquiries in his *Mund. ſubterraneus*, is an *Hungarian* mile, or 7 Engliſh miles diſtant from *Cremnitz*, and is not wrought in at preſent.

There is a Vitriol-mine in theſe Hills nigh the Gold-mine; the Earth or Ore of it is reddiſh, and ſometimes greeniſh. This Earth is infuſ'd in water, and after 3 dayes the water is powr'd off, and boyl'd 7 dayes in a leaden Veſſel, till it comes to a thick granulated whitiſh ſubſtance, which is afterwards reduced to a *calx* in an Oven, and ſerveth in the making of *Aqua-fortis*, or the ſeparating water, uſed at *Schemnitz*.

They have divers wayes of taking the Gold out of its Ore; by burning the Ore, by melting, by adding Silver-Ore and other Minerals, Sand and Lead; as they find the Ore fluid or fixt. But, to avoid prolixity, I will ſet down that way only, which they proceed in without Lead.

They break and pound the Ore, in water, very fine; they waſh it often, and lay it in powder upon cloaths, and by the gentle oblique deſcending of the water over it, and their continual ſtirring it, the earthy, clayiſh, and lighter parts are waſht away, while the heavier and mettalline remain in the cloth. Theſe clothes are afterwards waſht clean in ſeveral Tubs, and the water, after ſome ſettling, powr'd off from its ſediment; which ſediment is again waſht, and ſtirr'd up in ſeveral veſſels and troughs, till at length they ſprinkle Quickſilver upon it, and knead it well together, for an hour, and then waſhing it again in a wooden veſſel, after the ſeparating of much of it which the Quickſilver touches not; by ſtriking this veſſel againſt their leg, they bring the Gold and Quickſilver together, in an Amalgama, to one corner of it. From this Amalgama they ſtrain as much of the Quickſilver as they can through coarſe clothes firſt, and then through fine: they put the maſs remaining upon a perforated Plate, which they ſet over a deep pan placed in the earth; in in the bottom of which pan they alſo put quickſilver: This pan they cover, and lute the cover well, and then make a charcoal-fire upon it; they drive down the Quickſilver yet remaining in the Gold to the reſt in the bottom of the pan; then taking out the Gold, they caſt it into the fire, that it may ſtill become purer.

Concerning *Cranach*-Gold (of which you particularly inquire) I cannot learn, that there is any ſuch Gold, or place where Gold is digg'd, in *Hungary*; but in *Germany*, I think, there is: for *Agricola* mentions ſuch a place as *Golde-Cranachum* in his ſecond Book *de veter. & novis Metallis p.* 400. *inter Francos*; and in his fifth Book *de Natura Foſſilium p.* 254 mention is made of one place call'd *Golde-crona*, and another nam'd *Golde-Cranacum*.

Concerning the *Silver-mines*, there are divers of them at *Schemnitz* in *Hungary*, as the *Windschacht*, the *Trinity*, of *St. Benedict*, of *St. John*, of the *three Kings*, and ſeveral others of leſſer note. The chiefeſt and moſt wrought are thoſe of *Windſchacht* and *Trinity*.

They have no River here, but much water in the Mines, which is a double inconvenience to them, *viz.* to want water above, and to be glutted with it under ground, ſo as they are conſtrained to ſend much of their Ore to *Hodrytz* and other places, where are ſmall Rivers, by which their Bellows and Hammers may be mov'd, their Ore pounded, waſhed, and other works requiſite performed. Nor do they want Engins to pump the water out of the Mines, mov'd by wheels drawn about continually by horſes, 12 horſes at a time to each wheel.

In *Windſchacht*-mine, deep in the earth, is a large wheel of 12 yards diameter, turn'd about by the fall of ſubterraneous waters. This wheel moves Engines, which pump out the water from the bottom of the Mine up to the cavity, wherein this wheel is placed. The water, which moves this wheel, falls no lower into the Mine, but paſſeth away through a *Cuniculus* made on purpoſe, through which both this & the other water, pump'd from the deepeſt parts of the Mine, do run out together at the foot of an Hill.

Trinity-Mine is 70 fathoms deep; built and kept open with underwork at a great expence. Much of this Mine being in an earthy ſoyl, the Ore of it is much eſteemed. Divers veins lye *North*; and other rich veins run to the *North-Eaſt*. When two veins croſs one another, they eſteem it fortunate. So that all veins of Ore keep not the ſame point even in the ſame Mine; which would be an help to diſcover them; but they have no certain way to know either which way they run, or where they are, till by the induſtrious perſevering in the labour of the Mines they are at laſt found out. They uſe not the *Virgula divina*, but dig alwayes as the Adventurers deſire. They ſhew'd me one place, which they had digg'd ſtreight on 6 years, when the Ore was but two fathoms diſtant from the place where they firſt began: And in another place they digg'd 12 years outright, and at laſt found a vein, which in a ſhort time paid their charges

The blackiſh Silver Ore is eſteem'd the beſt; much of it hath a mixture of a ſhining yellow ſubſtance or Marchaſite, which if it be not in too great a quantity, is not unwelcom, by reaſon that it diſpoſeth the Ore to fluidity or renders it more eaſie to be melted; but if it be in too great a proportion, they are of opinion, that it preys upon the Silver in the Mine, and in the Furnace carries it away while it melteth, by overvolatilizing it; and therefore they term it a *Robber*, as a ſubſtance which ſpoyls, and takes away the richneſs of the Ore.

There is often found a red ſubſtance, which grows to the Ore, called Cinnaber, Cinnaber of Silver, *Cinnabaris nativa*, *Minium nativum*, or *Berg-cinober*; of which I have ſent you ſome by it ſelf, and ſome alſo ſticking to the Ore. This ſubſtance grinded with oyl maketh a Vermillion, equal to, if not ſurpaſſing, the Cinaber made by Sublimation. I diſcover'd a Sulphur in it, by caſting it upon an hot Iron-plate, on which it burned blew. Whether it alſo contains Quick-ſilver, I have not try'd, becauſe I would not diminiſh that ſmall quantity, here ſent. The Miners ſay they meet not with any.

There are alſo found in theſe Mines, Chryſtals, Amethyſts or Amethyſtine mixtures in the clefts of the Rocks, and ſometimes nigh or joyn'd to the Ore; as alſo Vitriol, naturally chryſtalliz'd in the earth in divers of theſe Mines, and particularly in a Mine in *Paradiſe*-hill near *Schemnitz*.

As there is great variety in the Silver-ore, as to its mixtures with Earth, Stones, Marchaſite, Cinaber, Vitriol, &c. ſo alſo in its richneſs, ſome holding a great proportion of Silver in reſpect of other: An 100 pound weight of ore ſometimes yields but $\frac{1}{2}$ an ounce or an ounce of Silver; ſometimes 2 ounces, 3, 4, 5, and unto 20 ounces. What is richer is very rare; yet ſome hath been found to hold half ſilver, and I have ſeen of it ſo rich, as to be cut with a knife.

A Specimen of each ſort of Ore, which they dig out of the Mines, is carried to an Officer call'd the *Probierer*, who is to prove and judge of its richneſs; which he doth in this manner. Of all ſorts of Ores he taketh the ſame quantity: the Ores being firſt dryed, burned, and pounded, he giveth an equal proportion of Lead to all, melteth and purifieth them, and then by exact ſcales takes notice of the proportion between the Ore and the Mettal contain'd in it, and reports it to thoſe employ'd in the great melting Furnaces.

If the Ore be found to hold 2 $\frac{1}{2}$ ounces or more of ſilver in 100 pound weight, they ordinarily melt it without any foregoing preparation, by the help of *Iron-ſtone* (which is not Iron-ore, but a ſtone found thereabout, of which the liver-colour'd is the beſt,) *Kys* (a ſort of *Pyrites*) and ***Slacken*** (a ſcum or cake taken off from the top of the pan, into which the melted Minerals run, and is a ſubſtance made out of the former mention'd, by fuſion;) which are thrown in with it into the melting Furnace.

If the Ore be poorer, holding but two ounces in an 100 pound weight, or leſs, it is firſt pounded and waſhed, till it becoms richer, or hath a greater proportion of Metal in reſpect of the Ore, much of the earthy parts being waſhed away. Then it is thrown into the Furnace with the former Materials; and the Marchaſite, which remains ſtill with it, as ſinking alwayes to the bottom with the ſilver in the waſh-works, helps to the quicker fuſion of the Ore.

Whatſoever is melted in the melting Furnace, is let out through an hole at the bottom thereof into the pan, which is plac'd in the earth before it, and, thus expos'd, it immediately acquires an hard ſcum, droſs, loaf or cake, which being often taken off from the top, the metal remaining in it becoms purer; to which is added Lead, and after ſome time the melted metal is taken out. Then being again melted in the Driving Furnace, the Lead, or what elſe remains mixt with the Silver is driven off by the blowing two great bellows, and runs over in the form of Litharge: that which firſt comes over is the *White*, and that which laſt, being longer in the fire, is the *Red*, not that it is Litharge of Gold, both being driven off from the ſame metal.

As *Chremnitz* Gold-ore hath Silver in it, ſo moſt of the *Schemnitz* Silver-ore holds ſome Gold; which they ſeparate by melting the Silver, then granulating it, and afterwards by diſſolving it in *Aqua fortis*, whereby the Gold is left at the bottom, and is afterwards melted; the *Aqua fortis* is diſtilled from the Silver, and ſerveth again for uſe.

The Silver then ſeparated from all its former aſſociats, is ſent to *Chremnitz*, where they coyn it into pieces of a mixt metal (which is the common Money of the Country,) after this manner: They melt it with about the ſame quantity of Copper, and run it into Bars, which they beat out; then ſoftning them in the fire, draw them out to an exact thinneſs between two Steel-Wheels; then they cut them out into round pieces with an Inſtrument like a Shomakers Punk, and then boil them with Tartar and Salt, ſhake them in a Sack with Small-coal and Water, dry them in a Kettle perforated, and afterwards they are drawn between two Wheels, in which they receive their Stamp.

So far this generous Travailer of the Hungarian *Gold-and Silver-mines: what he hath obſerved concerning the Copper-mines, and the Baths in thoſe parts, we muſt referr to the next opportunity.*

Some Inquiries relating particularly to the Bleeding of Walnuts; *ſuggeſted by Dr.* Ezerel Tonge *in a Letter of his to the Publiſher, of* March 22. 1670.

After I had been troubled a while at the Obſervation of Mr. *Willoughby*, concerning *Sycamores* ſtaying in hot, and running in cold weather, and had re-commended an *Hypotheſis* to ſalve the *Phænomena*, and to reconcile the ſeeming repugnancy's *, he hath rais'd two other difficulties for me, of *Sycomores* running in *November*, and *Walnuts* never running but in cold weather: The *former* of which Obſervations puts me out of conceit of a *Salvo*, I found, and offer'd, in my publiſht Papers, to *Birch* ſuppos'd to have run in *Autumne*, and found to have jelly'd the hole full at *Spring*, which was bored that time Twelve-Moneth before; and yielded not any ſap at all that *Spring*, as far as could be obſerv'd, and was not come to its ſeaſon of bleeding the ſecond *Spring*, when the Jelly was obſerv'd in the bor'd hole *. The *latter*, of the *Walnut* not bleeding but in cold weather, being inconſiſtent with the Obſervations, often made by me of that Tree, not only bleeding and bleeding longer in warmer weather, but bleeding longer at the roots on the South-ſide in the Sun, than on the North-ſide in the Shade, and conſtantly governing the Courſe of its Sap in its beginning to riſe and to ſtop daily at the riſing and ſetting of the Sun; I ſhall betake my ſelf, inſtead of opining, to make ſome naked *Queries* for the finding out the matter, *viz.*

---

* Of which in Numb. 57. p. 1165, 1166.

* *See* Numb. 44. *p.* 880.

1. Whether this Obſervation of Mr. *Willoughby*'s concerning the *Walnut-Tree*, was in Roots, Body, Branches; all, or ſome, or one?

2. Whether the Sap of a Tree, as to its motion, be not influenced from the Full or Wane, or other Aſpect of the Moon to the Sun, *&c*?

3. Whether the *Walnut*, being a more ſolid Wood, have not ſome alteration as to heat, aſcent of Sap, *&c.* from thence different from *Birch*?

4. What the Age and Bulk of the Tree, conſuming perhaps inſenſibly what roſe inſenſibly in hot, not in cooler Weather?

5. What the time of the Year? The *Aſpes* run only, as M. *Midford* relates, before *February*; the *Hopp* about Hopp-harveſt. *Withies* in *April*, &c.

6. Whether the weight of the Atmo-ſphere will put ſome check to Sap riſing in that part of the Root, which is cut off from the Body? And whether the excluſion of that Imped'ment, by cloſing the cut Root in Glaſs, will cauſe any ſenſible alteration: to be tried in ſeveral Roots of the ſame Tree of like Diameter.

I want a good *Thermometer*, *Barometer*, and *Hygro-meter*, (or if you will have Engliſh Names for them, a Heat-Weight-and-Wet-Wiſer) to make more accurate Obſervations, how far the aſcending of Sap depends on the Air, and the ſeveral temperatures of the ſame.

An Extract of a Letter Written by Francis Willoughby *Eſquire to the Publiſher, containing ſome Obſervations of his made on ſome* Sycamore-Trees, *the* Black-Poplar, *and the* Walnut: *As alſo his thoughts about the* Dwarf-Oaks, *and the* Stellar Fiſh *deſcribed in* Numb. 57.

I Am ſorry, I cannot return you a better Anſwer to yours of *March* 19; the Experiments, which our leaſure hath ſince permitted us to make, being not ſufficient to found a new *Hypotheſis* on; to confirm Dr. *Teng*'s. Since the Leaves have been explicated, we have obſerv'd the *Sycamore* after ſeveral froſty nights to bleed afreſh in the morning, ſoon after Sun-riſing, when it had ceaſed ſeveral dayes before: Though this muſt not be underſtood of all Sycamores, but of ſome only that are more ſenſible and obſervant of the Weather.

April 3d. and *4th.* all the Sycamores quite ceaſed.

The *5th.* being after a white froſt, they began to bleed about 8 a clock, and ceaſed towards noon.

The *9th*, *12th*, *13th*, *15th* they bled again.

The *10th*, *11th*, *14th* were not obſerved.

This *16th* they bled not, it being rainy, and the Sun not ſhining.

From the Obſervations we have hitherto made, we think it may be certainly inferr'd, that a morning-ſun after a froſt will make all the Bleeding Tribe bleed afreſh, though they had before ceaſed; and that this new bleeding towards the latter end of the ſeaſon commonly ceaſeth before morning. Poſſibly ſome may bleed after a froſt, yet further in the Summer.

I obſerved laſt year in *Auguſt* a copious and ſpontaneous exudation, very like bleeding, of a viſcous yellow Juice out of the buds of a black Poplar. Our *Walnut*-trees bleed here in *January*.

The *Starre-fiſh*, in the laſt *Tranſactions*, is the *Stella arboreſcens Rondeletii p.* 121. firſt deſcribed by him, and ſince by other Naturaliſts.

There is no ſuch dwarf-*Oak* in *Old England*, growing wild, as was ſent you out of *New-England*, nor in any other Country, where we have been, unleſs it be the *Ilex coccifera*, which is a low ſhrub, bearing large Acorns, and hath a prickly leaf like Holly. If it prove that, it will be a lucriferous diſcovery. ——*Midleton* in *Warwickſhire April* 16. 1670.

An Account of ſome Books.

I. Joh. Sig. Elſholtii, Elector. Brandenburg. Medici, *CLYSMATICA NOVA*, *ſive Ratio in venam ſectam Medicamenta immittendi. COLONIÆ BRANDEBURGICÆ*. 1667. in 8°.

THe *Title-page* of this Book, but very lately come into *England*, ſhews this to be the *ſecond Edition*: and the Author in the Concluſion of it tells the Reader, that the *firſt* Edition thereof was publick *A.* 1665. at which time he affirms there had been nothing printed (for ought he knew) either by *Engliſh*, *French*, or *Italians*, of this argument. To which we ſhall here ſay nothing, but refer the Candid Reader to what hath been ſaid already (by way of vindicating the Invention, both of *Infuſing* Medical Liquors, and of *Transfuſing* Blood, from uſurpation) in ſeveral of theſe Tracts, as *Numb.* 7. *p.* 128. *Numb.* 20. 353. *Numb.* 22. *p.* 385. *Numb.* 35. *p.* 677, 678, 679, 680, 681.

Mean time, this Author, having collected in this little Tract divers of the Experiments, made in *England*, *France*, and *Italy*, concerning theſe Inventions (of which we might have a far greater ſtock, and that a very conſiderable one, as to that of *Infuſion*, if our Learned and Candid Doctor *Timothy Clark*, one of his Majeſties Phyſicians in Ordinary, and a Fellow of the *R. Society*, could but find the leaſure of digeſting for the Preſs what he hath done on this ſubject many years ago) diſcourſeth of the particular Diſeaſes, wherein this Infuſing Chirurgery hath been uſed with ſucceſs, and ſuggeſts thoſe, to which it might be further extended with benefit.

II. Nicolai Hobokeni *ANATOMIA SECVNDINÆ HVMANÆ*, *Vltrajecti A.* 1669. in 8°.

THis Author, intending to inquire more narrowly into all the particulars concerning *Humane Generation*, premiſeth theſe Obſervations, touching the *Humane Secundine*, lately made by himſelf, and accompanied with 15 accurate *Schemes*, drawn, (as he ſaith) by his own hand, and repreſenting;

Firſt, in a Female *Fœtus*, the *placenta uteri*, together with the Membranes and String, on both ſides; where the ſame reſpects the *uterus* as well as the *fœtus*; and more particularly the Membrane *Amnios*, ſever'd from the *placenta*, and the Veſſels running through the other Membrane, *Chorion*; then, that portion of the ſtring, wherein the laxeneſs, inequalities and contorſions of the Membrane, together with all the contain'd veſſels in their proper ſcituation, are obſerv'd; next, the *Macula*, appearing ſomewhat prominent in one of the Arteries, by which may eaſily be found the paſſage of the Bloud to the *Placenta*, and its difficult regreſs towards the Navil of the *Fœtus*; more-over, the interiour ſubſtance of the *placenta*, and all the ramifications of the Veins and Arteries.

Secondly, in a Male-*fœtus*, a review of all the former particulars, together with ſeveral differences from that of the Female.

To theſe Obſervations is ſubjoyn'd a Collection of Letters, written by this Author to divers Learned men, touching *Generation*, together with their Anſwers: In which Collection 'tis intimated, that the Curious may now expect from Dr. *Dimerbroeck*, the famous Phyſitian of *Vtrecht*, his Anatomy, which by reaſon of his great practiſe, and a multitude of other avocations hath been hitherto retarded.

III. Joh. Ludov. Ganſii *M. D.* CORALLIORUM HISTORIA. *Francofurti A.* 1669. *in* 12°.

IN this Hiſtory the Author affirms to have digeſted both what hath been deliver'd of *Corals*, and what himſelf hath obſerv'd and try'd of that curious product of Nature, taken notice of by the Poet, 4. *Metam.*

> *Sic & Coralium, quo primum contigit auras*
> *Tempore, dureſcit, mollis fuit herba ſub undis.*

Which affirmation this Author looks upon as poetical indeed and fictitious, aſſerting, that Coral is originally a Mineral, and a kind of precious Stone, Corals being no berries petrified, but pieces filed off and turnd, from the trunck, round and poliſht.

His opinion therefore is, that Coral is form'd out of a glutinous Juyce, which being turn'd into Stone by a ſalt, abounding in it, riſeth up in the form of a Shrub, the ſalt being the cauſe, that maketh Plants ſpread into branches.

The places of the production of Coral he names to be, the *Red Sea* (where they are darkiſh,) the *Perſian Gulf*, the *Sicilian* and *Neapolitan* ſhore. Some of them are Red, others White, others Blackiſh.

To this Accompt he annexes various Preparations made of them; as alſo divers Solutions, of which he delivers one as an excellent diſſolvent both of Corals and Pearls, made of very well rectifi'd ſpirit of Salt, digeſted, and freed of its Corroſiveneſs, and then mixt with good ſpirit of Wine diſtill'd and brought over the Alembic. *May*-Dew is alſo much commended by him for a fit *Menſtruum*, if the ſpirits diſtill'd from it be joyn'd with its own Salt.

He treats alſo of the Magiſteries, Extract, Oyl, Tincture, Quinteſſence, Flowers; as alſo of the Vertues of Corals, and of the way of making factitious ones.

ERRATA, left uncorrected in ſome of the former Tracts

In No 54. p. 1082. l. 14. r. 4000. ib. l. 32. r. *Carniola* for *Carinthia*, p. 1083. l. 16. r. the *Rocks*, p. 1084. l. 19. r. *upon retiring* of the waters.

In No 56. p. 1135. l. 26. r. *our Iſland*, p 1137. l. 16. r. *britle diamonds*, ibid. l. 26. r *or digg'd*, p. 1138. l. 35. r. *were a continued and entire*, p. 1139. l. 35. r. *ſtrait or through winding*.

In No 57. p. 1147. l. 5. r. *communications*, ibid. l. ult. r. *deſire*, p. 1155. l. 33. r. *cleanſing*, p. 1158. l. 24 r. *found by*, p 1171. l. 18. r. *planetæ*, ib. *ſpectatur*, ib. l. 19. *ſpectatur*.

LONDON,
Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, 1670.

PHILOSOPHICAL TRANSACTIONS.

May 23. 1670.

The CONTENTS.

The Anſwer of Monſieur Marriotte *to Monſieur* Pecquet, *concerning the Principal Organ of Viſion; where occurr divers conſiderable Experiments. A Continuation of Dr* Edward Brown's *Account concerning the Mines of* Hungary; *where is a particular relation of the Hungarian Copper-mine, together with a Narrative of the many natural Baths in that Country and in* Auſtria. *An Account of* 3 *Books: I.* COSMOPOEIA DIVINA, *per Ludov. de Beaufort M. D. II.* CARTESIUS MOSAIZANS, *Auth. Joh. Amerpoel. III. The* DIVINE HISTORY *of the* GENESIS *of the* WORLD, *explicated and illuſtrated.*

The Anſwer

Of Monſieur Mariotte *to Monſieur* Pecquet, *about the Opinion, that the* Choroeides *is the Principal Organ of Sight; communicated to the Publiſher from* Paris, *and Engliſhed as follows.*

SIR,

I Have in your Anſwer * ſeen the reaſons, which hinder you from believing that the *Choroeides* is the Principal Organ of Sight; but though they were very Acute, and carried a great deal of Probability with them, yet I did not find them ſtrong

* *Vid. N°. 35. of theſe Tracts, p. 668, 669, 670, 671.*

enough to oblige me, to grant back again this Preeminence to the *Retina*.

You ſay, in your *firſt* Objection, that if the *Sclerotis* and the *Choroeides* be taken away from an Eye that is very freſh, and that the *Retina* be left diſtended on the Vitreous Humor, one ſhall not be able to ſee well through this membrane: whence you conclude, that it is not tranſparent enough, to let ſo much light, as is ſufficient for viſion, paſs upon the *Choroeides*.

In my opinion, there is good reaſon to doubt of this conſequence, ſeeing there may be a great deal of difference between the Retina of a dead Animal, after it hath been expoſed to the Ayre, and that of a living Animal, while it is exactly ſhut up between the Vitreous humour and the *Choroeides*. Different diſpoſitions do ordinarily change the qualities of things; Fat, which is tranſparent when it is melted, grows opacous after it is cold again; and the *Tunica cornea* of an Eye being held ſome hours in ones hand, in a hot Ayre grows thick, and a little after entirely opacous. But to the end you may be perſwaded, that the *Choroeides* is ſufficiently enlightned in a living Animal, you muſt take the Eye of an Ox (newly kill'd) while it is hot, and cut it in two, in ſuch manner that a good part of the vitreous humour may remain extended upon the *Retina*; then you ſhall ſee diſtinctly the colours of the *Choroeides*, the baſis of the Optick nerve, the trunck of the little veſſels which proceed from thence, and their diſperſion through the thickneſs of the Retina, with ſo much perſpicuity that you cannot even diſcern, whether there be a Retina beyond the Vitreous humour or no. Hence you may judge, that the light, which the Objects ſend to the *Choroeides*, is more than ſufficient for viſion, ſeing that being much weakned by the reflexion and by a ſecond paſſage through the Retina and the Vitreous humour, it is yet ſtrong enough to form a clear and diſtinct viſion of the *Choroeides* in our Eyes.

Not that I deny the Retina to have ſome whiteneſs in a living Animal, and that it is a little leſs tranſparent than the other Humours, chiefly in that part which is contiguous to the *Choroeides*; and Nature may have made it ſo on purpoſe to temper the brightneſs of great lights, and to hinder dazeling; in like manner as ſhe hath ſpread over our skin an inſenſible *Epidermis*, to keep it from being too eaſily hurt by thoſe bodies that touch us, and by the Exceſs of heat and cold. But if I ſhould abſolutely deny, that the Retina hath any opacity in a living Animal, your Experiment would not convince me, it being made but upon a Retina, whoſe more ſubtle and tranſparent parts are evaporated; and I might propoſe to you for an example a piece of white paper, through which, when it is wet, one ſees diſtinctly enough whatever is contiguous to it; and which preſently reſumes its firſt opacity, when it is a little while expoſed to the Air: And if this Example were not ſufficient, I might alledge the little Chryſtalline which is found in the middle of the Chryſtalline humour of many Animals, and is as it were the kernel of it; the which, being as tranſparent as the other humours of the Eye in a living Animal becomes in two or three dayes after his death white and opacous, notwithſtanding that it be left incloſed in the Eye, and that the Exteriour Chryſtalline remain ſtill tranſparent.

Your *ſecond* Experiment to prove the opacity of the Retina, which is to put it into water, is alſo extremely deceitful: For, you make no doubt but the *Hyaloeides*, which invelopes the Vitreous humour, is perfectly tranſparent: neverthleſs if you lay in a diſh half full of water part of the Vitreous humour, the parts of the *Hyaloeides*, which ſtick to it, will appear whitiſh and thick like a ſpiders web, although the Vitreous humour do ſtill retain its tranſparency. It is not then a ſufficient proof to know, whether the Retina be opaque in a living Animal, by putting it into the water: And by what tryal ſoever you make of it, after it has been expoſed to the Ayre, you can draw no conſequence to prove that it is opaque in its Natural ſtate: For the Chryſtalline it ſelf becomes a little thickiſh in water, and if it be left there ſome time, or expoſed to the froſt, it becomes white and opaque like ſnow.

It is therefore neceſſary for reſolving our difference, and for knowing with certainty, whether the light of objects paſs almoſt all entire to the *Choroeides*, or whether it is almoſt all intercepted by the *Retina*, to bring obſervations made on the *Retina*

and

and the *Choroeides*, while they are in their natural ſtate, as I ſhall do in the following Experiment.

Place by night a lighted Candle very near your Eies, and cauſe a dog, diſtant from the candle 8 or 10 paces, to look upon you, then you ſhall ſee in his eyes, a light ſufficiently bright, which I hold to proceed from the reflexion of the light of the Candle, whoſe image is painted on the *Choroeides* of the dog, which having much whiteneſs and luſter cauſes this very ſtrong reflexion; for if it proceeded from the Chryſtalline or Retina, the ſame appearance would be ſeen in the Eyes of Men, Birds, and other animals, who have the *Choroeides* black, which is not found ſo by us. It is therefore manifeſt by this Experiment, that the luminous rayes do paſs with a great deal of force as far as the *Choroeides*, and that the *Retina* receives very little impreſſion. Now this appearance is made in this manner: The little picture of the candle which is upon the *Choroeides* of the dog, (where is the *Focus* of the Chryſtalline and other humours together) ſending rayes back through theſe humours, makes its reciprocal *Focus* towards the candle, and by conſequence the eyes which are near to the point, where theſe rayes do reunite, ought to ſee the Chryſtalline of the dog very much illuminated. They that are skilled in Opticks know the demonſtration: and there is an effect, wholy like unto this, to be ſeen by a very eaſy Experiment.

Place a round Glaſs-bottle, full of very clear water, 8, or 10 paces from a Candle, and put behind the bottle, at near the diſtance of its Semidiameter, a white paper, in ſuch manner that one may ſee the light of the Candle, which hath paſſed thorow the bottle, reunited in a little ſpace upon the Paper; then they, who have their eyes near the Candle, ſhall ſee the bottle full of light, which will diſappear, if you hold the paper either nearer to, or farther from the bottle. And if one hold a ſmall lighted wax-candle in the place of the Paper, and you hold your eye in the place of the former candle, you ſhall ſee the bottle yet more enlightned then it was before: And one may eaſily judge, that the light which appeareth in the dogs eye, proceedeth from a like cauſe. The ſame experiment may be made in the eyes of ſeveral other Animals, and particularly of Cats, in whoſe eyes this light appears blewiſh, which ſhews, that it proceedeth from their *Choroeides* which hath much of this Colour; but this Colour, nor any other which may be in the *Choroeides*, brings no confuſion to the Senſe of Seeing, for the Senſes receive no impreſſion from their own Organs.

The reſt of this firſt Objection hath almoſt no other foundation, but an interpretation you give to ſome words of my writing different from my ſenſe; for, when I ſaid, that dark and opaque bodies receive a great deal of impreſſion from the light; I did mean dark and opaque bodies both together; for it had been ſufficient for me to name dark bodies, ſince all dark bodies are opaque; but my thought on this ſubject was, and ſtill is, that tranſparent bodies, as the Ayre, the Water, and the Retina in a living Animal, receive *little* impreſſion from light, and that Opaque bodies receive a *great deal*, but that dark bodies receive more then all other Opaque bodies, and the Air and the Water a little leſs than the Retina.

Nor do I believe, that darkneſs is abſolutely neceſſary for Viſion, but only for a ſtrong viſion; nor that the picture of objects ought to be expreſſed on the Organ of Viſion; for, it ſufficeth, that the rayes of each point of the Objects be reunited in a diſtinct and ſeparated point, according as they anſwer one another; and you will eaſily agree, that as a Convex glaſs makes the image of the Sun to appear on white paper with a great deal of brightneſs and light, and on black paper very obſcurely; although black paper (which ſoon takes fire) receives a great deal more impreſſion than white: So the rayes of illuminated objects do reunite on a whitiſh *Choroeides*, and expreſs there a viſible picture, and on a dark *Choroeides*, a very obſcure one, and which cannot be ſeen; but then the impreſſion is alſo much ſtronger in the black than in the white: And this is the cauſe, why Men and Birds ſee better and more diſtinctly then the greateſt part of other Animals; for their *Choroeides* being black, and by conſequence very ſenſible of light, they contract much their pupilla or ſight-hole of the Eye, which makes the Rayes, that paſs there from each point of the Object, to be all very near the

Axis of the Chryſtallin, and to reunite more exactly in a point, then in the Eyes of moſt other Animals, which have their *Choroeides* white towards the *Axis* of Sight, and by conſequence leſs ſenſible of light, who in recompence can very much dilate the Pupilla of their Eyes, when they ſtand in need of a great light; but alſo their Sight is not ſo diſtinct, becauſe the Rayes, which fall on the Extremity of the Chryſtalline, do interſect the Axis too near in their refraction.

It is true, that to ſupply in ſome ſort this defect, they have a little Chryſtalline in the middle of the great one, and this little Chryſtalline being of a more ſpiſs conſiſtence then the great one, its refraction is alſo more ſtrong, and makes the rayes, which come from one point in the *Axis* and paſs near the Center of the Chryſtalline to refract more then if there had been but one Chryſtalline. And by this means the greateſt part of the Rayes, which fall upon the Extremity of the great Chryſtalline, do interſect the *Axis*; which cauſes their ſight to be leſs confuſed, although it be never ſo diſtinct as that of Men and Birds, which have but one Chryſtalline. *Fiſhes* have alſo a double Chryſtalline, for otherwiſe their ſight would be more confuſed than that of other Animals who live in the Air, for their Chryſtalline being ſpherical, the rayes cut the *Axis* more unequally than if it were lenticular and its convexities were of a greater ſphere; and it ought neceſſarily to be ſpherical, becauſe the refraction of the Rayes, which paſs from the water into the Chryſtalline, is very ſmall, and would make its *focus* too far diſtant if the Chryſtalline were lenticular.

The difficulty of your *Second* objection proceeds alſo from an Ambiguity of words, and conſiſts in knowing, what we are to ſay it is, that has a great continuity and communication with the Brain. My *Hypotheſis* is, that the Nerves are all coated with the *Pia Mater* (which envelops all the Spinal Marrow) and have with it the ſame continuity of fibers; ſo that if theſe nerves be never ſo little moved, the impreſſion is carried to the Brain by the Continuity of theſe fibers; and whether it be, that the texture is different in Nerves of different ſenſes; or that they contain ſome ſpirituous liquors which determine their ſenſations, by ſome differences they have among themſelves; it is certain, that the Nerves of Sight, in what manner ſoever they are moved, repreſent Colours and Lights; thoſe of Hearing, Sounds, and thoſe of the Touch, Paines, &c.

Now the *Choroeides* is an Expanſion and dilatation of the *Pia Mater*, which enveloppes internally the Optique Nerve, and which comes from the tuberoſity of the Spinal Marrow, by a continuity of fibes s; whence it follows, that how little ſoever the *Choroeides* be toucht, the impreſſion may be eaſily communicated to the brain: And to the end, that the ſame thing may be ſaid of the *Retina*, there muſt be a little channel in the Optic nerve, through which the Retina in its proper Subſtance extends it ſelf to this tuberoſity by a continuity of Fibers; which is not ſeen, and you are conſtrained to ſay, that there are little filaments of nerves which come from the interiour of the Optick, and expand themſelves through the Retina, which have this continuity; but if there were theſe filaments, they ſhould ſpread themſelves through the Retina, as from a Center to a Circumference, and ſhould lye cloſer together near the Optick nerve, than a good way farther in the Retina: which neverthe-leſs we do not obſerve to be ſo.

Beſides, if you thruſt a pin through the thickneſs of the Retina, you will often meet with filaments; but if you look on them through a Convex glaſs, you will diſcover, that they end in little veſſels of Veins and Arteries, which are in the Retina; and infallibly, if there were any nerves, you might find them in the ſame manner, and they would ſtop the Pin, ſince they are as hard and firm as the little Arteries; and when you ſay, that one may diſtinguiſh theſe filaments in the water, becauſe the reſt of the Retina diſappears, 'that is repugnant to experience, and to what you have ſaid before, *viz.* that the Retina may be ſeen all white in the water, and without tranſparency; and you ought to ſhew theſe filaments, or elſe we ſhall take them for a thing invented at pleaſure.

You bring after that two Experiments; the *firſt* of which is, that if an aperture be made on the upper part of the Eye, we may diſcover the Picture of the Objects on the anterior ſurface of the *Retina*; but if this aperture be made in the white of the

Eye, the aqueous humour will run to the *Tunica Cornea*, and make wrinkles, which will hinder the Picture from being diſtinct: Beſides, he that looks in at this aperture, will hinder the Rayes of the Object from paſſing into the Eye, and he ſhall ſee nothing there but his own image. But if you mean, that the *Tunica Cornea* ſhould be wholly taken off, there will not then be diſtance enough between the *Chryſtallin* and the *Retina*, to make the Picture diſtinct. In concluſion, I do not believe this Experiment can be made, much leſs that it is to be diſcerned whether this Picture be formed on the anteriour or poſteriour ſurface of the *Retina*, ſince the thickneſs of it is leſs than half a line, or the 24*th* part of an inch; and there is reaſon to believe, that you have truſted to the report of ſome other concerning this Experiment; or that you have believed the images which appear in the Eyes to be painted on the *Retina*, whereas they proceed from the reflexion made on the exteriour of the *Cornea*.

Your *ſecond* Experiment is true and eaſie to be made, but according to you it were impoſſible; for, ſince you hold, that it is on the anteriour part of the *Retina*, that the Picture is ſeen, and that you have elſewhere ſaid, that one cannot well ſee through this Membrane, it follows, that you cannot ſee this Picture through the thickneſs of the *Retina*; but becauſe I believe, there remains tranſparency enough in that part of the *Retina* which is not expos'd to the Air, I doubt not but the Picture may be ſeen on the poſteriour part of it, after it is become ſufficiently opake, though in a living Animal this Picture paſſeth as far as the *Choroeides*, as it hath been already proved: and if the *Retina* it ſelf were taken away, and there remained only the vitreous humour, you might notwithſtanding ſee the inverted Picture of the Windows toward the bottom of the Eye, if you held it at the farther ſide of the room; in the ſame manner as the Picture is to be ſeen in the *Focus* of the ſpherical Glaſs-bottle fill'd with water, though it ſeem to be on the exteriour ſurface of the Glaſs; and by conſequence this Experiment proves not the opacity of the *Retina*.

In your *third* Objection you quote, what I ſaid, a little otherwiſe than I ſpoke it; for I put in my Writing, that the *Retina* was *about* half a line in thickneſs, and not half a line *preciſely*;

which ſhew'd, I had not meaſur'd it exactly; but if it were but a quarter of a line or leſs, it ſufficeth that it had enough for the effect I did attribute to it: And for another, I did alſo mention in my Writing, which is, that the Rayes of the ſame luminous point, which do not unite preciſely in the ſame points in the *Axis*, are rectified by the concavity of the *Retina*, thoſe that are fartheſt off the *Axis* more than thoſe which are the neareſt, which is the reaſon they unite better in the ſame point on the *Choroeides*; the which point I hold (with you) to be *Phyſical*, ſince the points objective are ſo too; but I hold it to be leſſer than any that can be perceptible to the ſight; for we diſtinguiſh the different parts of very ſmall objects, as the extremities of the breadth of the little arteries of the *Retina*, which make not an eigth part of its thickneſs; and that which repreſents this ſmall breadth, muſt be 25 or 30 times leſs in the Organ of our ſight, that is to ſay, in the proportion of the diſtance of the Object, to the Centre of the ſight, and of the diſtance of this Centre, to the Organ of viſion; and by conſequence the thickneſs of the *Retina* is not proper for this ſmallneſs.

You ſee, then Sir, that hitherto your objections have been able but very lightly to ſhake my opinion, and that the tranſparency of the Retina is well enough eſtabliſhed: Let us come now to the proof, I make of the *Want of Viſion*, on the Baſis of the Optick Nerve.

It muſt firſt of all be agreed, that in this Experiment, almoſt all men do looſe ſight of an intire circle of white paper, whoſe diameter is about the *9th* or *10th* part of its diſtance from the Eye. Now the viſual Triangle, whoſe Baſis is the Diameter of the Circle, and whoſe top is the Center of viſion, is proportioned to the Triangle, whoſe Baſis is the Diameter of the picture of the Circle on the bottom of the eye, and the top, the ſame center of ſight; the which center being diſtant *6* or 7 lines from the baſis of the optick nerve, whoſe breadth is about ¾ of a line, this baſis alſo will be about the *9th* or *10th* part of its diſtance from the Center of ſight, and by the Principles of Opticks, the Image of the circle of the white paper, falling on the baſis of the optick nerve, will cover it preciſely; and becauſe the Paper then wholly diſappears, it follows, that all the baſis of the Optick nerve is inſenſible of light; whence I conclude, that the *Choroeides* is the Principal Organ of ſight; and that the *Retina* is not, ſeeing it is placed in that part, and is there apparently diſpoſed in like manner as to the reſt of the bottom of the Eye.

To elude the force of this Argument, you alledge other cauſes of this fault of ſight; the two firſt are almoſt like one another. But it ſeems to me, that you ſuppoſe them without any ground: for, as I ſaid before, there are no ſuch filaments of nerves to be ſeen coming out of the baſis of the optick nerve; beſides, they are not proper for viſion, ſince they would leave in the parts of the Retina too great intervals empty; and its neceſſary, that every point of the Object find a ſenſible point in the Organ of ſight to unite his rayes there; which is found in the *Choroeides*, which is an Expanſion of the ſenſible part of the nerve into a continued membrane. Beſides, the cauſes of the defect of viſion cannot be found in theſe *Hypotheſes*; for in the firſt, what reaſon can be given, that there ſhould be no extremities of nerves oppoſite to the optick nerve. ſince there would need only a ſimple direct continuation of ſome of its fibers unto the Anteriour part of the Retina; and for the ſecond (which is the particular opinion) I ſee not, how the void ſpace in the middle of the inverted Tuft, can comprehend all that extent of the baſis whence it proceeds, and why the filaments begin not to receive the impreſſion of the luminous Rayes, but upon the Extremity of this baſis, ſince the rayes of a luminous point, which unite themſelves in a point at the bottom of the Eye, come from divers points of the Chryſtalline, and ſo, if one part of theſe rayes were oblique, the other ſhould be perpendicular, and if all the Rayes ſhould fall perpendicular on the Organ of ſight, there would be no viſion, ſince there is never but one ſingle Ray of thoſe which unite in a point, that falls perpendicular. But I ſhall not inlarge my ſelf to demonſtrate theſe impoſſibilities, ſince I am perſwaded, that theſe inverted tufts, and theſe filaments of which they are compoſed, are but things without a foundation, and which you would have much a doe to ſhew us.

The other Cauſe which you bring, is the trunk of the veſſels which proceed from the baſis of the nerve. Yet you cannot deny but they are very ſmall; and that it is very hard to diſcern the little holes through which they paſs, when the nerve is cut off above its inſertion into the Eye; and becauſe they often come out of the baſis by two ſeveral little holes, the diameter of each of which does not take up the ſpace of above the eighth part of the diameter of the baſis; it follows, that if the reſt of the nerve were ſenſible of light, we ſhould not looſe ſight of a paper of two inches diameter at moſt, at ten foot diſtance: and ſometimes in fixing one eye on a little piece of Paper, two other, very little ones, ſeparated one from the other, would diſappear; which is contrary to experience: for the default of viſion is continued. Seing than the reaſons which you alledg of this default of ſight are either inſufficient, or want an aſſured foundation, it follows, that that which I propoſe muſt ſtand, at leaſt, in reſpect of any thing you urge againſt it. And to confirme it yet more, I will adde here ſome reaſons and obſervations, which are neither in my letter nor in my writing.

The firſt obſervation which is very common, is that of the Pupilla dilates it ſelf in the ſhade, and contracts it ſelf in a great light, and it is very hard to find the cauſe of this unvoluntary motion, but by the Hypotheſis, that the *Choroeides* is ſenſible of light, for then it is eaſy to conceive that it being hurt by too ſtrong a viſion, it may dilate or contract its fibers, which have one continuity with thoſe of the forepart of the *uvea*, ſo that it can contract its aperture, and when it is not hurt, relax it again: whereas if the Retina be ſuppoſed to be the Organ of ſight, it will be very difficult to explain how this contraction is made.

The ſecond is that of the glaſs bottle full of water, when a lighted candle is placed near its focus: for it is eaſy to prove that if one hold his hand between the Candle and the bottle, he will feel more heat than if he held it in the reciprocal Focus; that is to ſay, the place where the Rayes, which have paſſed thorough the bottle, make a great image of the flame of the Candle appear inverted upon a white ſurface oppoſed to it: for I draw this conſequence, that the Image of a Candle, which is painted on the *Choroeides* of a dog, as I have prov'd to you, makes a much greater impreſſion on the Retina of the dog, than on that of him that lookes on it and ſees it very bright; whence I conclude that if the Retina were the Organ of ſight, this dog would not ſee the objects indifferently inlightned, which are about the candle, although at 3 or 4 foot diſtance, becauſe they would receive a great deal more impreſſion from this reflexion, and that a great ſenſation doth obliterate a leſſer; which is contrary to experience, and it is not at all likely, there ſhould be ſuch a defect in the ſight of Animals.

The third is, that the Eyes of *Birds* are ſo framed, that the Optique nerve after its inſertion into the Eye is inflected, and extends it ſelf on the Concavity of the *Sclerotis* about the breadth of 2 or 3 lines more or leſs according to the bigneſs of the Eyes; and the length of this inflection is covered by the *Choroeides*, leaving but one little white ſtreak in the middle, from whence the *Retina* takes its Original, which extends it ſelf on the *Choroeides* through all the bottom of the Eye, but it is covered on the ſide of this white ſtreak with a little black membrane as long as the inflexion of the nerve, and almoſt as broad; which proceeds from the *pia mater*, and is as it were an appendix of the *Choroeides*: and if you conſider the ſituation of this membrane, you will find it is near the Axis of ſight, and that the rayes of the Objects, which the Birds look on with both Eyes, fall preciſely upon it after their refraction. Since then in the place, where Viſion ought to be ſtrongeſt, the *Retina* is covered, and that no man doubts but Birds are more clear-ſighted than other Animals; you ought to acknowledge, that the *Retina* is not the principal Organ of Viſion, but that that preeminence belongs to the *Choroeides*.

AN ACCOMPT

Given by Doctor Edward Brown, *concerning the Copper-mine at* Herrn-ground *in Hungary*.

H*Errn-ground* is a little town, ſeated very high between two Hills, upon a part of land of the ſame name, an Hungarian mile diſtant from *Newſol*. In this town is the entrance into a large Copper-mine, very much digged.

I went in through a *Cuniculus*, called *Tach-ſtoln*, and continued divers hours in the Mine, and viſited many of the moſt remarkable places in it. The ſteep deſcents in this Mine are made by Ladders or Trees ſet upright, with deep notches or ſtayers cut in them to ſtay the foot upon. They are not troubled with water, the Mine lying high in the hill, ſo that the water may drain away ; but they are moleſted with duſt and damps.

The Veins of this Mine are large, many of them cumulate, and the Ore very rich ; in an hundred pounds of Ore they ordinarily finde twenty pounds of Copper, ſometimes 30, 40, half Copper, and even to 60 in the hundred. Much of the Ore is joyn'd ſo faſt to the rock, that tis ſeparated with much difficulty. There are divers ſorts of Ore, but the chief difference is between the Yellow and the Black : the Yellow is pure Copper-ore : the Black contains alſo a proportion of Silver.

They find no *Quick-ſilver* here : the mother of the ore is yellow ; and the Copper ore, heated and caſt into water, maketh it become like that of ſome Sulphureous Baths.

They ſeparate the Metal from the Ore with great difficulty.

The Ore commonly paſſes 14 times through the furnaces : ſometimes it is burned, and other times melted ; ſometimes by it ſelf, and ſometimes mixt with other minerals and its own droſs.

There are divers ſorts of *Vitreol* found in this Mine ; Green, Blew, Reddiſh, and White. There is alſo a Green Earth or ſediment of a green water, called *Berg-grun*. There are likewiſe ſtones found of a beautiful green and blew colour, and one ſort, on which *Turcoiſes* have been found ; therefore called the *Mother* of the *Turcois*.

There are alſo two Springs of a Vitriolat water, which are affirm'd to turn iron into Copper. They are called the Old and the New *Ziment*. Theſe Springs lye deep in the Mine. The Iron is ordinarily left in the Water 14 dayes. I here preſent you with ſome pieces of it, and with an Heart and a Chain, formerly Iron, now appearing to be Copper. Divers of theſe pieces I took out of the old *Ziment*. They are hard within the water, and do not totally looſe their figure, and fall into powder, as you will perceive by them ; they will eaſily melt. I have ſent a piece melted without the addition of any other ſubſtance. They make handſome Cups and Veſſels out of this Salt of Copper : I drank out of one of them, when I was at the *Verwalter of Herngrownd* his houſe: It was gilded over, and had a rich piece of Silver-ore, faſtned in the middle of it, and this Inſcription grav'd on the outſide,

Eiſen ware Ich, kupfer bin Ich,
Silber trag Ich, Gold bedeckt mich.

i. e. Copper I am, but Iron was of old,
Silver I carry, cover'd am with Gold.

AN ACCOMPT

Concerning the Baths *of* Auſtria *and* Hungary; *as alſo ſome* Stone-Quarrries, Talcum rocks, &c. *in thoſe parts: By the ſame hand.*

IN order to anſwer ſome of the other *Queries*; I here preſent you with this Accompt concerning *Baths*, and ſome other ſubjects, contained therein.

Baden is a little City in *Auſtria,* four German miles Southward from *Vienna*, ſeated on a plain, but nigh unto a ridge of hills, which are the excurſions of Mount *Cetius.* It is much reſorted unto by reaſon of the Natural Baths of that place, wherein the Springs are ſo numerous, as to afford convenient Baths; two within the Town, five without the Wall, and 2 beyond a rivolet called *Swechet.*

The *Dukes-Bath* is the largeſt, about 20 feet ſquare, in the middle of an houſe of the ſame figure, built over it. The Vapour paſſes, through a tunnel of wood, at the top: and the Water is conveyed into the bottom of the Bath, at one corner, through woodden pipes and trees, under the Town-wall, from the Spring head, which riſeth at a little diſtance Weſt-ward. The Springs of the reſt of the Baths riſe under them, and are let in through holes of the Plancher, for all the Baths are wainſcoted, the ſeats, ſides and bottoms being made of Firre. The Water for the moſt part is clear and tranſparent, yet ſomewhat blewiſh, and maketh the skin appear pale in it, as doth the ſmoak of Brimſtone. It coloreth Metals (except Gold, whoſe colour it alſo heightens) turning them black in a few minutes. The Coyn of this Country, mixt of Copper and Silver,(having $\frac{7}{15}$ of Silver, and $\frac{8}{15}$ of Copper) is in a minutes time turn'd from a white into a dark yellow, and ſoon after becomes black. To the Moſs and Plants, which it waſheth, it gives a fine green colour, and leaves often a ſcum upon them of a Purple mixt with white. As it runs from the Spring-head, it ſomewhat reſembles the Sulphur-river in the way from *Tivoli* to *Rome*, but is not ſo ſtrong or ſtinking, nor doth it incruſtate its banks.

The Spring-head is alſo conſiderable, in regard that it riſeth under a rocky hill at ſome diſtance from the entrance into it: For, I paſſ'd to it, about the length of 40. yards, through an Arched paſſage cut in the rock, which is alſo a natural ſtove, (as that of *Tritola* and *Bajæ*) made by the hot Bath water running under it. Moſt part of this Cave is incruſtated with a white ſubſtance, by them called *Salt-Peter*, whereof I have ſent you ſome. At the mouth of the Cave it becomes harder and ſtony. I cauſed ſome of the pipes, through which the Bath-water runs, to be opened, and from the upper part of the pipe, I took ſome quantity of fine Sulphur in powder, ſomewhat like Flowers of Brimſtone; this being as 'twere, ſublimed from the water, and not depoſed, being found in the upper part of the pipe. *Oleum Sulph. per campanam* dropped into this water, is received into it quietly. *Oleum tart. per deliquium* cauſeth an ebullition, as in the making of *Tartarum Vitriolatum*.

The ſecond Bath within the Wall is that of our *Lady*, about 12 foot broad, and 24 long. One end of it is under a Church of the ſame name. This is fuller of Sulphur than the reſt, and more blew, and leaveth a yellow Flower upon the boards, as the others doe a white.

The third is the *New Bath*, out of the Town nigh the Gate; which when I ſaw was full of people ſinging.

The fourth, the *Jews Bath*, which hath a partition in the middle to ſeparate the men from the Women.

The fifth, St. *Johns Bath*, of a Triangular form.

The ſixth, the *Beggars Bath*, alwayes ſhallow, ſo as they ly down in it.

The ſeventh, the Bath of the *Holy-Croſs*, about two fathoms ſquare, chiefly for the Clergy.

The eighth, Saint *Peters Bath*, greener than the reſt.

The ninth, the *Sower Bath*, ſet about with Stone-balaſtres, and covered with an handſome Cupola and Lanthorn. The water is very clear; In the Steam of this Bath I have often colour'd mony black without touching the Water; and ſtaying only in the room, where the Bath is, the buttons of my clothes, and whatelſe of Silver the Vapour could come at, were colored yellow or guilded; and yet the water itſelf, once cold, changeth not the colour of Metals, though boyled in it.

The hotteſt of theſe Baths have not the heat of the *Queens Bath* at *Bath* in *England*. They uſe no Guides, as with us, but direct themſelves with a ſhort turn'd ſtaff.

Manners-dorff, ſeated under an Hill on the Eaſt-ſide of the river *Leyta* hath onely one Bath. It riſeth under a Church, built over the Spring-head. The water of it is luke-warm, and therefore they boyl it in great Coppers, when they deſire it hotter, and bath in Tubbs, fill'd with this boyled water. From the ſubſtance, which ſticks to the Coppers in boyling, it is collected, that it is impregnated with Sulphur, Salt-peter and Chalk. This water coloureth the ſtones in it of a fair green like a Turkois; and the Steam of it, which ſticks to the Moſs under the Church, turns into drops of Gold or Amber.

Dotis, 2 Hungarian miles from *Comora* in Hungary, famous for being watered with great numbers of Springs, hath alſo Sulphureous Baths, ſaid to be warm in Winter. I was there in *March* and *October*, and both times found their warmth very remiſs, ſcarce perceiveable. In colour they are blewiſh, and to taſte acid. The *Queens-bath* and the *Great-Bath* riſe in a Marſh, North-ward of the Caſtle. There is another Bath in the Governors garden within the Town. They are uſed as thoſe of *Manners-dorf*, by being boyl'd, and powr'd into Bathing tubbs.

At *Banka*, two Hungar. mile from *Freiſtat*, in a Meadow, I took notice of 15. Baths: And there have been more, but the river *Waag* eateth away the banks, and ſwallows up the Baths, and into three of theſe 15. it hath alſo broke in. The Water of theſe is like to that of *Baden* in *Auſtria*; it leaves a white Sediment upon the Moſs and places it waſheth, and tinctureth metals black: which I experimented by putting money into it; and ſticking ſome into the ground over which the water paſſeth, that part, which was in the ground, retained its own colour, and the other part in the Bath-water acquired a Coal-black. Theſe Bathes are open, and very hot.

The Baths of *Boinitz* nigh the river *Nitra* in Hungary, are of a moderat gentle heat, delightful to bath in, much beautifi'd by Count *Palfi* Palatine of *Hungary*: And all of them covered under one large roof. The firſt is the Noblemens Bath, built of ſtone deſcended into on all ſides by ſtone-ſtayres. Four more there are of Wood, but very handſomly and well built.

At *Stub'n*, 3 Hungarian miles from *Newſol*, and 2 from *Chremnitz*, near to a rivolet, are divers Baths of great eſteem, and much frequented; the water whereof is clear, and ſmells of Sulphur; the ſediment green. It colours the wood over it green and black, but does not change the colour of metals ſo ſoon as moſt others. I left money in it a whole night, which was yet but faintly coloured. The Springs ariſe under-neath, and paſs thorough the holes in the plancher of the Baths. The heat thereof is anſwerable to the *Kings-Bath* in England. Theſe Baths are 7. The firſt, is the Noblemans Bath. The ſecond, the Gentlemans. The third, the Country-mans. The fourth, the Country-womans. The fifth, the Beggars-bath. The ſixt, for ſuch as are infected with the *Lues Venerea*. The ſeventh, the Bath of the *Gypſies*; of whom there are many in thoſe parts. Theſe Baths are in a plain, encompaſſed on all ſides with hills. The nigheſt unto them are towards the Eaſt; and it is the ſame ridge of hills, which on the other ſide are ſo rich in Metals.

Glas-Hitten, an Hungarian mile, or about 7. Engliſh-miles from *Schemnitz*, hath five Baths; two of which are large. It depoſes a red ſediment, and incruſtates the wood and ſeates of the Bath under water with a ſtony ſubſtance; and it guildeth Silver. But the moſt remarkable of theſe Baths is that, which is called the *Sweating* Bath, whoſe hot Springs drain thorough an hill, and fall into a Bath, built to receive them; at one end of which, by aſcending, I went into a Cave, which is made a noble Stove by the heat of theſe *Thermæ*, and ſo order'd with

Seats, that every one who ſits in it, either by chuſing an higher or lower ſeat, may regulate his ſweating, or injoy what degree of heat he deſireth. This Cave, as alſo the ſides of the Bath, are covered, by the continual dropping of theſe hot ſprings, with a red, white and green ſubſtance: the red and green make the beſt ſhew, but the white is uſed againſt the Stone, and cureth Ulcers and ſore backs of horſes.

Eiſen-bach, about 4 Engliſh miles from *Glas-Hitten*, and 5 or *6*. from *Schemniz*, hath alſo hot Baths; which I ſuppoſe are thoſe inquired after in your laſt Queſtion. Here are ſent you divers pieces of that ſediment and ſtone, taken out of theſe Baths; and one, which I took from the end of a Spout, through which theſe *Thermæ* had formerly paſſed. The wood ſtill ſticks to the bottom of it, but is not turned into ſtone (as you may ſee:) Yet I have ſeen great trees, plac'd at the top or ſuperficies of the water in the Bath, which have ſuffered petrifaction. Here are two convenient Baths, much frequented; and a third, which is made by the water let out of the former, called the *Snakes-bath*, from the number of Snakes coming into and delighting in it, when it is filled with theſe warm waters.

The natural Baths of *Buda* are eſteem'd the nobleſt of *Europe*, not only in reſpect of the large and hot ſprings, but the magnificence of ther Buildings. For the *Turks* bath very much, and, though little curious in moſt of their private houſes, yet are they very ſumptuous in their Publick Buildings, as their *Chans* or *Caravanſara's*, *Moſches*, *Bridges* and *Baths* declare.

There are 8 Baths, whereof I had opportunity to take notice during my ſtay at *Buda*; 3 towards the Eaſt and South-Eaſt-part of the City, in the way leading towards *Conſtantinople*; and 5, towards the Weſt-end of the Town in the way towards *Old Offen*, and *Strigonium*.

The firſt, is a large open Bath at the foot of an high rocky hill, formerly called *Purgatorium*, whereof the people have ſome odd and ſcruplous apprehenſions.

The ſecond is cover'd with a *Cupola*, and ſtands nigh the ſame Hill, but more into the Town, and near a place where they uſe Tanning.

The third is called the *Bath* of the *Green Pillars*, though at preſent they be of a red colour; and it ſtands over againſt the *Caravanſara*. The water is hot, but tolerable, without addition of cold water. It is impregnated with a Petrifying juyce, which diſcovers it ſelf on the ſides of the Bath upon the Spouts and other places, and maketh a gray ſtone: And the Exhalation from the Bath, reverberated by the Cupola, by the Irons extended from one Column to another, and by the Capitals of the Pillars, formeth long ſtones like Ice-icles, which hang to all the ſaid places; ſuch as may be obſerv'd in many ſubterraneous Grotto's, and particularly in *England* in *Okey-hole* in *Somerſet-ſhire*, and *Pooles-hole* in *Darby-ſhire*.

The water is let out at night, when the women have done bathing, who often ſtay late. The Bath is round ſet about with large Pillars ſupporting a Cupola, which hath openings to let out the ſteam thereof; and yet the whole room continues to be an hot ſtove.

The Baths of the Weſt-end of the Town are 1. *Tactalli* or the *Bath of the Table*; a ſmall Bath covered: the Water white, and of a Sulphureous ſmell. They drink of this as well as bath in it. What they drink, they receive from a Spout, bringing the Water into this place. I delivered a *five-ſols*-piece to a Turk, bathing in it, to guild for me, which he did in about a minute, by rubbing it between his fingers, while the hot water fell from the ſpout upon it.

2. *Barut Degrimene*, or the Bath of the *Powder-mill*. It riſes in an open pond near the high way, and mixeth with the freſh Springs, ſo that the pond is of a whitiſh colour in one part, and clear in the other, as alſo cold and hot in ſeveral parts. This conveyed croſs the high way into a Powder-mill, becomes uſeful in making of Gun-powder. They conceive here, that this Bath communicates with the Sulphureous Springs at *Dotis*, many miles diſtant.

3. *Cuzzoculige*, the little Bath or the Bath of the *Saint*; for which name the Turks give a ſuperſtitious reaſon. 'Tis kept by Turkiſh Monks. The Bath, where the Springs ariſe, is ſo hot as ſcarce to be endured; but being let out into another bathing place at ſome diſtance, it becomes tolerable and fit for uſe. This water hath neither colour, ſmell, nor taſte different from Common water, and depoſeth no ſediment; onely the ſides of the Bath are green, and have a fungous ſubſtance all over.

4. *Kaplih*, a very noble Bath, but part of the buildings was conſumed this year (1669) by a great fire which happn'd in *Buda*; but is by this time repaired by the Turks. The water is very hot, not without a petrifying juyce in it. The Building about is eight ſquare, with a noble Bath in the middle: with a circle of a Trench of water about it for the better ornament. On every ſide it has a *Nichio*, wherein is a fountain. In the middle of the Antichamber (where they leave their cloaths) there is alſo a fair Stone-baſon and a fountain.

5. The Bath of *Velibey*; which hath a ſtrong Sulphureous ſmell, and a

petrifying juyce in it; and is ſo hot, that to make it tolerable, it requires the addition of cold water. This is the nobleſt Bath of any. The Anti-chamber very large, the Bath-room capacious, and high-arched, and adorned with 5. Cupola's: one a very fair one, over the great round Bath in the middle; and one leſſer, over each of the 4 corners; where are either Baths or Bath-ſtoves for more private uſe: In theſe the Turks take off the hair of their Bodies by a *pſilothrum* mixt with ſoap; it being not their cuſtom, to have any hair, except on their beards, and a lock on the crown of their heads. Twelve Pillars ſupport the great *Cupola*, between 8 whereof are fountains of the hot water, and between the other are places to ſit down, where the Barbers and Bath-men attend. And each of theſe places have 2 ciſterns of free-ſtone, into which are let in hot Bath-water and alſo cold water, to be mixt and tempered as every one pleaſeth.

Men bathe in the morning, and *Women* in the afternoon. When any man intends to bathe, having entred the firſt rooms, he findes there divers ſervants attending, and furniſhing him with a cloth and apron. Then he puts off his apparel, and having put on the apron, he entreth the 2d room, wherein the great Bath is, and ſits on the ſide of the Bath, or between the Pillars nigh a fountain; where the Barber ſtrongly rubs him with his hand opened, ſtretching out his armes, and lifting them up; after which the party batheth. Then, if he be a ſubject of the *G. Signors*, or, it be the cuſtom of his Countrey, he hath his head ſhaved, and if a young man, his beard, except the upper-lip. Next, the Barber rubs his breaſt, back, arms and legs, with an hair-cloth, while he either ſitteth, or lyeth with his face downward; then waſhes his head with ſoap, and after throws cold water upon him all over his Body; and ſo the party walks about in the ſteam of the Bath for a time.

Theſe Baths are made uſe of two wayes, *either* by entring into the water, *or* ſitting about the Bath in the ſteam. For the vapour of the Bath makes the whole room a ſtove; and moſt ſweat as long as they ſtay in it; and ſome enter not the water at all, but have it powr'd upon them, or elſe only continue in the ſteam of the Bath; which ſufficiently provoketh ſweat.

So much of the Baths. Upon the ſide of Mount *Calenberg*, towards the North are Stones marked with Trees and Leaves. In the Hermitage of the *Camaldulenſes*, ſeated upon a Peak of this hill, I ſaw fair ones, with which they pav'd the walk in their Gardens. This place is 2 German miles from *Vienna*.

Not far from *Manners-dorf* is the Emperor's *Quarry of Stone*, out of which are made the beſt Buildings in *Vienna*: In which, where-ſoever there is a cleft or ſeparation of one ſtone from another, the water falling betwixt them, leaves a petrification, thereby, as 'twere, healing the wound, by making a ſtony *callus*, not exactly like the parts, which it joins together.

An Engliſh mile from *Freiſtat* in *Hungary* North-ward, is a Quarry of Stone, out of which many great Stones are digged, tranſparent and reſembling Sugarcandy.

At *Banca*, two Hungar. miles from *Freiſtat* North-ward, is a Quarry of white ſtone, nigh the Hot Baths of that place; over which is a lay of Chalk of about a yard thick, very beautiful to the Eye, as being of all colors, except green; ſo finely mixt, ſtreaked, and ſhaded, that it ſurpaſſeth Marble-paper; and the water dropping upon it, doth as twere varniſh it.

At *Schemnitz* in Hungary, famous for Silver-Mines, is an high perpendicular Rock, part of which, from the top to the bottom, is naturally tinctur'd with a ſhining fair blew and green: And I have heard from a Spaniard, who liv'd long in the Weſt-Indies, that there is alſo a rock, like this nigh to the Silver-mines in *Peru*.

The Mountain of *Cliſſura*, being a part of Mount *Hæmus*, as alſo Mount *Pyrlipe* (both which I paſſed over travelling from *Belgrade* towards *Lariſſa* in *Theſſaly*) doe ſhine like Silver, and day and night, either by the light of the Sun or Moon, afford a glittering pleaſant ſhew, cauſed by the great quantity of *Muſcovy-glaſs*, wherewith theſe Hills abound. There are alſo *Talcum-rocks* nigh *Spitall* in upper *Carinthia*, as I have been informed by M. *Donellan*, who liveth there. I am unwilling to omit an Hill nigh *Sarvizza*, two dayes journey on this ſide *Lariſſa*, which conſiſts of an earth of a fine red colour, out of which the red Earthen Veſſels of that Country are made; as alſo the great number of *Acidulæ* nigh *Tranſchin* in Hungary, there being 32 plentiful ſprings of them; likewiſe an Hot Bath nigh *Bellacherqua* in *Bulgaria*, it being ſcituated farr from any habitation, yet well built by the Turks, and very refreſhing to Travellours. It hath a red ſediment, and maketh a gray ſtone.

Being at *Lariſſa* in *Theſſaly*, where the *Gr. Segnor* hath long reſided, I underſtood, that he had paſſed a good part of the hot Summer of 1669. upon the neighbouring mount *Olympus*; and by the Interpreters to the Emperours Reſident, the *Illuſtriſſ^{o} Signor di Caſa nova*, (who were obliged to attend the *Sultan* upon the mountain) I was inform'd that there was a Spring of a whitiſh water upon that Hill, which was drank of by many perſons in their great heat and thirſt, contracted by aſcending the mountain, but proved very deſtructive unto them in 3 dayes, they then complaining of an heavineſs and coldneſs of their Stomacks till they dyed.

An Account of ſome Books.

There being lately fallen into our hands three Books written by ſeveral Authours, concerning the Production of the World, all three pretending to aſſert and confirm what is delivered by Moſes *in the firſt of* Geneſis, *though they do it different wayes; We thought, it would not be un-acceptable*

table to the Ingenious, to give them here a taſte of theſe Treatiſes, thereby to excite them to a further diſquiſition and elucidation of this matter. We ſhall herein follow the order of the time, wherein theſe Books were publiſht; and therefore begin with

I. COSMOPOEIA DIVINA, ſeu Fabrica Mundi explicata, per *Ludov. de Beaufort* Pariſinum Med. Doct. *Lugd. Batav.* 1656. in 12°.

This Authour having in the *Dedication* of his Book profeſſed his averſion from deviſing any other Syſteme of the world, than that, which is deſcribed by *Moſes*, and having alſo expreſſed his labors and endeavours to adjuſt and accommodate all the *Phænomena* of Nature to the mind of that Divine Writer, tells us,

In his firſt Section, that God in the beginning of Time created, in a ſpace before void, *Heaven* and *Earth*, or the Matter of both, and of all things comprehended therein, as an unſhapen Maſſe, continued, un-divided, and un-moved: And that afterwards by his divine cheriſhing and ſeparating power he reſolved that dull and moveleſs matter into moving *waters*, or divided it into innumerable parts, and put it into motion by that diviſion, and by the introduction of a *vacuum*; by the means of which imparted motion, the particles began to extricate themſelves, to ſtirre, and to tend to their ſeveral places, and to afford the firſt Rudiments of three Ranks of great Bodies: ſo that, after the ſpace of 12. hours or thereabout, ſome *Light* began to appear, there being then ſo much of that ſubtile matter collected, as was ſufficient to illuminate a certain medium.

In the *ſecond* Section, that the Creator formed the *Firmament*, as a kind of Arched Vault in the *midſt of the Waters*, that is, more perfectly diſtinguiſht three Ranks or Material Principles of Bodies, *viz.* one in the middle, the *Firmament*, and two extreams, retaining the name of *Waters* but movable and moved: For, ſince on the firſt day all the parts began to be gather'd into three *Claſſes*, and the groſſeſt to take the loweſt place, the leſs groſs, the middlemoſt, and the fineſt, the uppermoſt, he conceiveth, that the Firmament was well ſaid to have been made this 2d day, foraſmuch as the Celeſtial matter was collected in the middle, and placed 'twixt the ſubtiler, whoſe place was above, and the thickeſt Elementary, being below: Which *Waters* were ſimply ſo called before, as then actually conſtituting but one fluid body, but now diſtinguiſh'd into three ranks.

In the *third*, that the Creator began to ſubdivide the *third* rank, or the *Seas*; ſo that the *Dry* began to appear, which he called *Earth*; reſolving and raiſing upwards into vapors and exhalations the thinner particles, thence to produce *Air* and *Fire*; which are the four commonly ſo called Elements and reputed ſimple Bodies: out of which the other are compounded, firſt the imperfectly mix't, then gradually the more perfectly mixt, and after that the *Vegetative*, which about the end of this day began to be actually produced.

In the *fourth*, that he made the *Sun*, *Moon* and *Stars*, adorning and perfecting the Heavens. Where the Author thinks it no wonder, that theſe were not created before the fourth day, in regard there was required more time for the framing (without a new Miracle) ſo many and ſuch various *vortices*, thence to form the Heavens and the Stars, than for a ſimple ſeparation of the Water from the Earth.

In the *fifth*, that he produced Senſitive and Moving Creatures, of a lower order, *viz. Fiſh*, and *Fowle*.

In the *ſixth*, that he brought forth the other more perfect Animals, namely the *Beaſts of the Earth*; over which, as over all the reſt, the Great and Bountiful Creator ſet *Man*, whom he form'd after his own Image, endowing him with a Mind, and conſtituting him an *Epitome* of the Univerſe, and his Lievtenant General and Governour on Earth.

In all which the Author taketh notice of two Soverain Miraculous Works; *firſt*, the Production of the Matter of the World out of Nothing; the *ſecond*, the Diviſion and Motion cauſed in that Matter: declaring, that the other works may be conceiv'd to be produced without a new Miracle in the ſpace of the ſix dayes, enumerated by *Moſes*. Beſides, he takes occaſion, to explicate the nature of Motion, and to give the Laws of the ſame; to ſhew the neceſſity of a *Vacuum before* and *in* the Formation of the World; and *to* ſolve the Arguments alleadged againſt a *Vacuum*; In ſhort, *to* deliver his opinion, concerning all the main parts of Natural Philoſophy.

II. *CARTESIUS MOSAIZANS*, *Auth.* Joh. Amerpoel. *Leowardiæ* 1669. *in* 12°.

THe deſign of this Author is to make it out, that the Philoſophy delivered by the famous *Des-Chartes* doth well agree, at leaſt not diſagree with the Hiſtory of the Creation, recorded by *Moſes*. A deſign, which that Eminent Philoſopher entertained himſelf, and would have ſet upon, if Death had not prevented him, as appears in his Letters to *Merſennus*, *viz.* the 24th and 53d of the 2d *Tome*, where he affirms, that comparing his Principles with the Moſaick Hiſtory he had found, to his wonder, that the latter could be much better explicated according to the former, than by any other of all thoſe ways, wherein Interpreters have hitherto explain'd it.

To evince this, our Author hath taken the pains to make a parallel between the firſt Chapt. of *Geneſis*, and the Principles of *Des-Chartes*, endeavouring to make it appear.

1. That *Moſes* as well as *Des-Chartes* did acknowledg in the Corporeal Sphere of things nothing but one Homogeneous and Uniform *Matter*, divided and diverſify'd by *Motion*, put into that Matter by the Creator, and preſerv'd therein by the ſame.

2. That both begin their Philoſophy from the Conſideration of *Light*, as the firſt Effect of the Diſtinction of things from one another.

3. That both do attribute a *Fluidity* to the Heavens; yet ſo, as that *Des-Chartes* enlarges upon the *particular* Diſpoſition of the Conſtituent parts of that Body, which *Moſes* is ſilent of.

4. That the *Carteſian* Doctrine of the Diſtinction of the *Earth* from the *Waters* and *Air*, and of the proper Conſtitution of each of them, is not inconſiſtent with that of *Geneſis*.

5. That the growth and variety of *Vegetables*, and the cauſes thereof, aſſign'd by *Des-Chartes*, do not diſagree with the ſame Sacred Hiſtory.

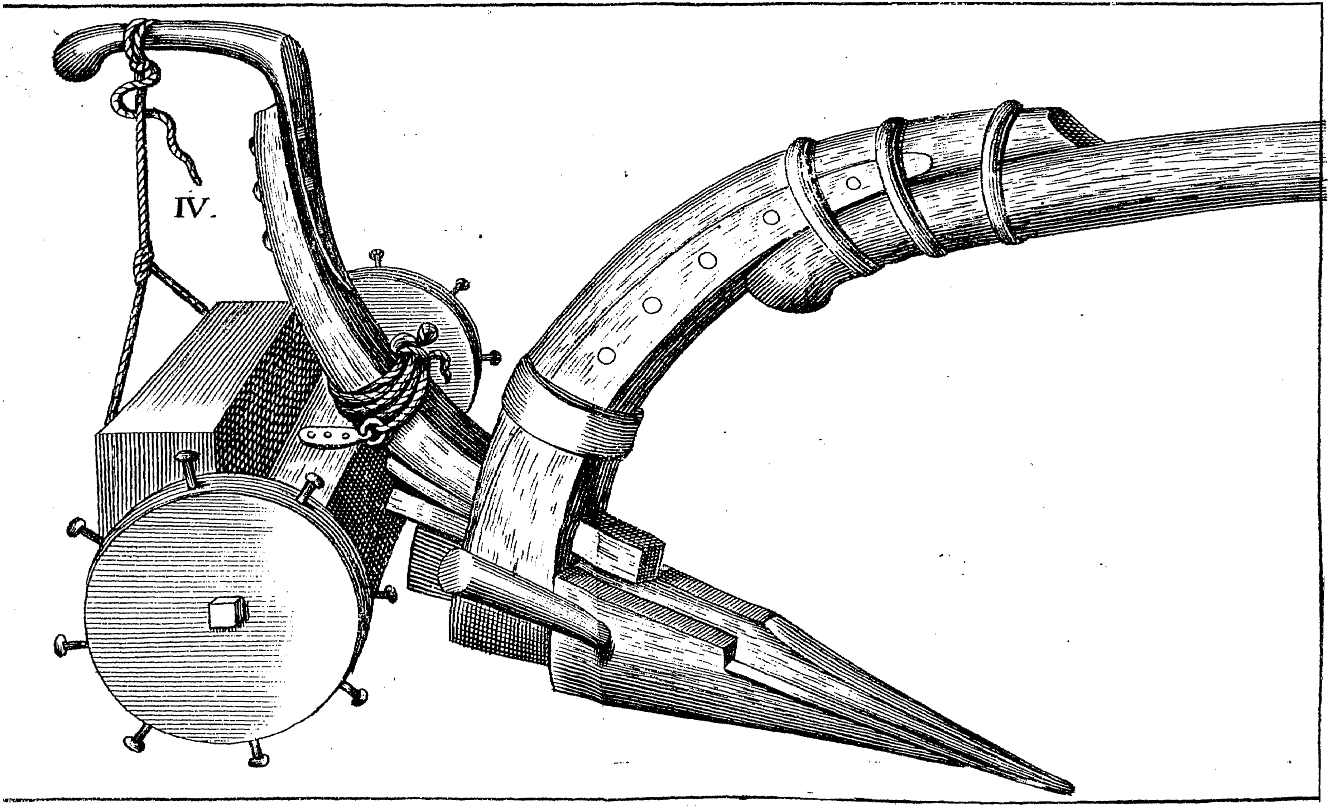
6. That the *Carteſian* Doctrine of the Conſtitution and Uſe of the *Luminaries* and *Fix't Stars*, and their difference from the *Planets* and *Comets*; as alſo that of the *Motion* of the *Earth about the Sun*, and its own Axis, and the deflexion of its Axis from the Paralleliſme to the Axis of the Ecliptick, and the keeping in a perpetual Paralleliſme to itſelf, is very rational; and conſequently not incongruous to that of the Divine Philoſopher.

7. That there is a great agreement between *Moſes* and *Des-Cartes* in aſſigning the difference between the *Life* of *Beaſts*, and the *Soul* of *Man*; foraſmuch as both teach, that the *former* conſiſts in the *Bloud*; Which *Des-Chartes* further declaring, teacheth, That the Bloud heated in the Heart and ſubtilized into Spirits, is diffuſed from the Heart and Arteries through the Brain into the Nerves and Muſcles, and by a continual influx into the ſame, moves the whole and wonderfully contrived Frame of the Body and all the parts thereof; according to the various impulſes and actions of Objects upon them: But that the Soul of Man conſiſts in *Thinking* and *Underſtanding*, whereby principally Man reſembleth his Creator, to whoſe Image he is made. Which difference is confirm'd by what *Moſes* ſaith, that God commanded the *Earth* to bring forth *Living Creatures* or Beaſts, as well as he commanded the *Earth* to produce *Plants*; whereas, after he had formed Man out of the *Earth*, he is ſaid to have breath'd into him the *Breath of Life*, whereby Man became a Living *Soul*, not only *Living* and Moving, but a *Soul* too, that is, perceiving and knowing.

The third Book, promiſed in the Contents, we muſt refer to the next, for want of room.

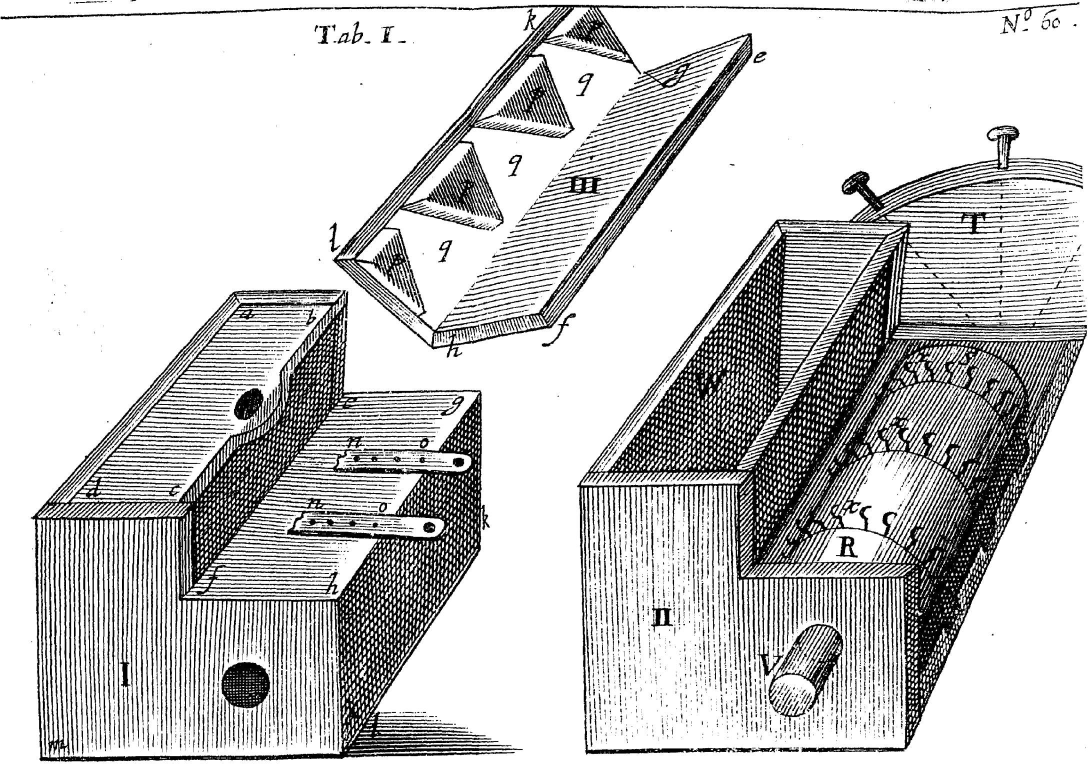
ERRATA *left uncorrected in* No. 55. *Pag.* 1104. l. 21 *r.* one digits obſcuration. *p.* 1106. l. 22. *put out*, The Horizontal Parallax, *and read*, The Moons true place ♓ 17^{d}. 35^{m}. 47^{s}. ♓ 17^{d}. 37^{m}. 51^{s}. *Betwixt this and the line preceding, inſert*, The Horizontal *Parallax* 53m. 10s. *Pag* 1108. l. 19. *make the Parallax of Longitude in the ſecond Columne*, om 32^{s}; *and betwixt the* l. 21 *and* 22. *inſert*, with apparent South-latitude 4^{d}.24^{m}. 59^{s}. | 4^{d}28^{m} 48^{s}. l. 33 *and* 34 *read, the*
{ Subingreſs. 16.43.3.
{ Emerſion 18. 2.24.
Pag. 1111. l. 15. *for* 52m. *r.* 52m. 52 $\frac{1}{2}$s. Pag. 1119. l. 3. *r.* about 28. inches.

London, Printed by *T. N.* for *J. Martyn* Printer to the R. *Society*. 1670.


IV.

Tab. I.

N.º 60.



PHILOSOPHICAL TRANSACTIONS.

June 20. 1670.

The CONTENTS.

A Letter of John Evelyn *Eſq; to the Lord Viſcount* Brouncker, *concerning the Spaniſh* Sembrador *or new Engin for Ploughing, Equal Sowing, and Harrowing, at once; together with a Deſcription of the Contrivance and Uſe of this Inſtrument. An Account of the Obſervation, made, a while ſince, by the Royal Academicians at* Paris, *of an* Halo *about the Sun; together with M.* Hugens *his Diſcourſe concerning the Cauſe of thoſe Meteors, as alſo that of the* Mock-Suns. *A Diſcourſe of Dr.* Rob. Wittie, *about Mineral Waters, and Extracts made out of them. An Accompt of ſome Books.* I. *The DIVINE HISTORY of the GENESIS of the World,* (promiſed in the Contents of the precedent Tract, but not then inſerted, for want of room.) II. *FRANC. TRAVAGINI Super Obſervationibus aliquorum Terræ-motuum PHYSICA DISQUISITIO.* III. *QUÆSTIO TRIPLEX de ANNO, MENSE & DIE CHRISTI NATI BAPTISATI & MORTUI, Auth:* Mich. Seneſchalo *è S. Jeſu.* IV. *HERMANNI GRUBE M. D. Commentarius de modo ſimplicium Medicamentorum facultates cognoſcendi. V. De LACTE LUNÆ Diſſertatio Medica,* Joh. Danielis Majoris.

A Letter of John Evelyn *Eſq;, to the Right Honourable the Lord Viſcount* Brouncker, *Chancellor to her Majeſty and Preſident to the* R. Society *&c. Concerning the Spaniſh* Sembrador *or New Engin for Ploughing, and Equal Sowing all* *ſorts of Grain, and Harrowing, at once; By which a great quantity of Seed-corn is ſaved, and a rich increaſe yearly gained; together with a Deſcription of the Contrivance and Uſes of this Engin, Engliſh't out of* Spaniſh, *and lately preſented to the* R. Society.

My LORD,

I Cannot deviſe better how to expreſs my great reſpects to your Lordſhip, than by my utmoſt endeavors to promote the Intereſt of that *Society*, over which you have ſo long, with ſo much ability and affection, and ſo faithfully Preſided. *This* therefore will plead my excuſe with your Lordſhip, if in ſome confidence of gratifying the generous deſignes of that Noble Aſſembly, I communicate to them, through your hands, not only the *Inſtrument*, (which I herewith preſent them) but the Deſcription of the *Uſe* and *Benefit* of it from ſuch a *Deferent*, as I am ſure they will very highly value. My Lord, it is now almoſt two years ſince, that (by ſomewhat an odd accident) lighting upon a paper lately printed in *Spaniſh*, I found a ſhort paſſage in it, giving notice of a certain *Plough* newly brought out of *Germany* into *Spain*; in both which places it had (upon *Tryal*) ſo generally obtain'd, as (beſides the *Royal Priviledg*, which was granted to the Inventor) to procure the Univerſal Approbation. Upon this hint, I took the boldneſs to write to My Lord Ambaſſador, intreating his Excelly, that, as his more weighty affairs would give him leave, he would not diſdain to inform himſelf more particularly concerning it. *This* his Lordſhip was not only pleas'd to do, but ſo highly obliging, as to tranſmit to me the Engin it ſelf, together with a full Deſcription of it, and its uſe: All of it written with his own noble Hand, which I do here conſecrate to the R. Society, to be inſerted among their precious *Cimelia*.

My Lord, being not ſo happy, as to wait on you my ſelf with it at your publick Aſſembly this day, I deſire, your Lordſhip will cauſe theſe Papers to be read there, and expoſe the Inſtrument to their Examination and Tryal. There are many

Gentlemen, who will not be offended with theſe *Ruſticities*, and who know, how highly ſuch *Inventions*, and even *Attempts* have been valued by the greateſt and the beſt of Men. Something (tis poſſible) may happen to be out of order, by reaſon of the long Journey it hath paſſed; but their Ingenious *Curator* will ſoon be able to reform, and, if need be, improve it. My Lord of *Sandwich* is that Illuſtrious Perſon, to whom the *Society* is obliged for this, and many other Favors, and Productions of his own more conſummate *Genius*, which enrich their Regiſters. But, let me tell them, his Lordſhip hath made, and brought home with him, ſuch other polite Notices and Particulars of *Spain*, and other Forrain Parts, as I know no Perſon of the moſt refin'd and publick Spirit, who hath approached him, beſides your Lordſhip: An Emulous and Worthy Example certainly to the reſt of our *Noblemen*, and *Miniſters* of *State* abroad, who may travel with ſo many Advantages to inform themſelves above Others: And it is to me a ſhining Inſtance of both your Lordſhips happy *Talents*, and great *Comprehenſion*, that in the throng of ſo many and ſo weighty Employments, you can think of Cultivating the *Arts*, and of doubly obliging your Country. How do ſuch *Perſons* enamel their *Characters*, and adorne their *Titles* with laſting and permanent honors! This Teſtimony of my Juſt Veneration to both your Lordſhips I could not, upon this Occaſion, but ſuperadd, who am

Says-Court My Lord
23. *Febr.* 16$^{69}_{70}$. *Your Lordſhips moſt humble, moſt devoted*
and moſt obedient Servant

J. Evelyn.

Follows now the Extract of the Deſcription of this Sembrador, *Don* Joſeph Lucatelo *Knight*, *of the Province of* Carinthia, *a Subject of the* Houſe of Auſtria, *Inventor of the Engin*, *Dedicated to Signor Don* Geronimo de Camargo, *Councellor of the* Conſejo Real de Caſtilla, *and of the* Hazienda Real, *and by Commiſſion of his Catholick Majeſty made Judge* Protector *and* Conſervador, *for the better Diſtribution, and Direction of the uſe of the ſaid Inſtrument.*

After the *Inventor* had in the Dedication appeal'd to Don *Geronimo de Camargo* as an Experimental Judge and Eye-witneſs of the Performances of this Inſtrument, and taken occaſion to celebrate the happineſs of the latter Ages upon the account of the *Inventions* of many Excellent things, as the Uſe of the Loadſtone; Gun-powder; Great Ordinance; Printing; the Ordering of Quickſilver to ſeparate the nobler from the baſer Metals; the Perfecting of Watches by Pendulums; and many more: After this, I ſay, it is repreſented,

Firſt, That both the Ancient and Modern Husbandmen have agreed, that the Perfection of Agriculture conſiſted in ſetting the Plants in proportionable ſpaces, and giving ſufficient depth to the Roots, that they may ſpread enough, to receive that nouriſhment from the ground, which is neceſſary to produce and ripen the fruit: For which reaſon we ſee, that Plants are ſet in rowes by rule and meaſure, as the Vine, Olive-trees, and other Fruit-Trees; and in Gardens, the Herbs, and Flowres are planted and ſow'd with ſome order and diſtinction, ſo that their over-nearneſs and the confuſion of their Plantation may not hinder their growth.

Secondly, That care hath not been had in the practice of this important part of Husbandry, ſince even at this day all ſorts of Seeds, of Corn and Grain, are ſown by handfuls, throwing them out by aime, heedleſly and by chance (counting it too tedious and chargeable to ſet them one by one in large fields;) whence we ſee Corn ſow'd in ſome places too thick, in others too thin, and the greater part of it not cover'd, nor deep enough, whereby it is not only expos'd to be eaten by Birds, but alſo, in Cold Countrys, to be ſpoyled by Froſt, and in Hot Regions, by the Sun.

Thirdly, That, upon theſe Conſiderations, He (D. *Joſeph de Lucatello*) hath, ſome years ſince, given himſelf to invent an Inſtrument, which with great eaſe, and with litle charge or trouble, ſets grain in order and proportion, for the ſparing a great quantity of Seed-corn, and enriching the Crop: And that after much Experience he hath perfected and reduced unto practice thoſe *idea's*, producing an Inſtrument, which being faſtn'd to the Plough, at once Ploughes, Soweth, and

Harrows, whereby is ſaved the labor of the Seeds-man, and the grain falling in order, and in the bottom of the furrow, all of it remains in one and the ſame diſtance under ground, ſo that of five parts of ſeed, four parts are ſaved, and then in the Crop is gain'd incredible abundance.

Thirdly, That the Inventor having obtain'd a thing ſo beneficial to Mankind, thought it reaſonable to communicate it to the World under the Patronage of one of its Greateſt Monarchs; and ſo preſented it at the feet of his *Catholick Majeſty*, who received the Propoſition, and cauſed trial to be made thereof in the *Buen Retiro*, where it did anſwer expectation, notwithſtanding the drought of the year, then much damnifying all Corn; an ordinary Husbandman from a meaſur'd ſpace of ground there, ſow'd in the common manner, reaping 5|125; where he, by his contrivance, from an equal ſpace of ground there alſo, reaped 8|175; beſides the ſeed ſaved in the ſowing.

Fourthly, That thereupon his ſaid *Catholiek Majeſty* did grant to the Inventor the Priviledge, That he only and his Aſſignes may make and diſtribute theſe Inſtruments in all the Kingdoms and Provinces of that Monarchy *in Europe*, at the price of 24 *Rials Plate*, each, and *out of Europe*, 32 *Rials Plate*; of which the fifth part ſhould be paid to the King; prohibiting alſo to all, that have not the leave of the Inventor or of perſons authoriſed by him, the making of this Inſtrument, under the penalty of 1000 *Eſcud. d'oro*, to thoſe that are able to pay it, and to others, that are unable, other puniſhment equivalent thereunto: And not only thoſe, that make it, but ſuch alſo, as buy and uſe it, are lyable to the ſame penalties, which are to be divided into three parts, $\frac{1}{3}$ to the *Camera*, $\frac{1}{3}$ to the Judge, and $\frac{1}{3}$ to the Informer.

Fifthly, That for the better Execution hereof, and proviſion in all Caſes that may happen for the introduction and Conſervation of this Inſtrument, his Catholick Majeſty hath nominated *D. Geronimo de Camargo*, for Judge *Conſervador*, with full power to depute ſuch perſons, as he ſhall think fit, within and without *Spain*, for the exerciſe of his Authority, and for receiving his Majeſties due upon this Licence.

Sixthly, That before the *Inventor* came to the Court of *Spain*, he made divers Tryals in his own Country, wherein he ſucceeded according to wiſh; and thereupon made the great tryal of this Engin before his preſent Imperial Majeſty, in the fields of *Luxembourg* in *Auſtria*, where the land uſually yields four or five fold; but the Crop from the ground ſow'd with this Inſtrument was *ſixty* fold, as appears by a Certificate given in *Vienna Aug.* 1. 1663. ſt. n. by an Officer of the Emperor, appointed to ſee the ſaid ground ſowed and reaped: which Certificate was thought needleſs to inſert here *verbatim*.

Seventhly, That this Priviledge being diſpatch't and the Seedtime then approaching, he (the *Inventor*) forthwith publiſht his Contrivance, and Inſtructions, as follows;

1. There is a Box of Wood, having a Cylinder or Roler paſſing at each end into two wheels, ſet about with ſtrong nails, and divided into three equal parts, ſurrounded upon the lines of diviſion with litle Bras-ſpoons, equally diſtant from one another, ſo as each of them in one row is poſited over againſt the middle of the oppoſite interſtice of the other row; which Spoons in the turning of the Inſtrument take up, each, one ſingle grain at a time, and throw it out at certain holes, into the ploughed ground. The parts of it are theſe: In the firſt *Plate*, repreſenting this *Sembrador*, *Fig*. I. ſhows the Intire *Box* without the Wheels; *a b c d* the cover of that part, where the Corn is put in, which is open in *Fig*. I. at W. And *e f h g k l*. the two ſides which cover that part of the Box, where the Cylinder, which is ſtuck round with three rows of litle ſpoons, is moved about to throw out the Corn; which ſides are taken off in *Fig*. 2. to make the Cylinder RS with the Spoons *x x x* appear: the inner ſhape of which ſides is expreſs'd in *Fig*. 3; where may be ſeeen the four Triangular pieces *p p p p*, leaving Triangular interſtices *q q q*, which ſerve to conveigh the Corn carryed up in the Spoons, and diſcharged at the top of the Cylinder, ſo as they may juſt run out at the holes underneath the Box, the parts of which anſwer to the parts of the firſt *Figure* according to the letter. T. is one of the Wheels; V, the other end of the Cylinder, upon which the other wheel is to be placed.

2. This *Sembrador* muſt be tyed faſt to the Plough, in the

manner as is ſeen in *Fig.* 4; ſo that the Corn may fall in the furrow, and, at the turning of the Plough, the Ears of the Plough may cover the Corn of the laſt furrow with earth.

3. Becauſe the Seed ſow'd by this *Inſtrument*, is plac'd in a convenient depth, *viz.* in the bottom of the furrow, whereas the ſeed ſcattered the comon way remains nearer the ſuperficies of the Earth, or quite uncovered, therefore it muſt needs ſhoot forth ſomewhat later; ſo that it is requiſite, the Husbandman, uſing this Inſtrument, ſhould ſow 8 or 10 days ſooner than the accuſtom'd Seed-time (that the Corn may ſprout forth on the face of the Earth in convenient time) and make an end of ſowing with the ſame as many days before others; *viz.* beginning to ſow in the midle of *September*, and making an end at the midle of *November*.

4. In ſtiff ground the furrows ought to be 5 or 6 inches deep; in middle ſort of ground, 6 or 7; and in light and ſandy ground, 7 or 8 inches; and according to this proportion the husbandman muſt govern himſelf deepning or ſhowling the Plough, as the condition of the land ſhall require.

5. Eſpecial care muſt be had, that the Wheels of the ſide of the Inſtrument do always turne round, and never drag along without turning; as alſo, that the Ears of the Plough be made ſomewhat bigger then the ordinary ones.

6. 'Tis alſo convenient, that the Seed be well ſifted and clean'd, that ſo the litle Spoons may every time take up a grain, and the Seed be the better diſtributed.

7. In *Barley* 'tis to be well obſerved, that it be made clean in that manner that the ſtraw and beards be broken off as near the grain as may be, that ſo they hinder not the iſſuing of the grain out of the Inſtrument.

8. After Seeds-time done, furrows muſt be made to drain the land of water, according to the uſe of each Country, without doing any thing more extraordinary, until the Harveſt.

This Inſtrument and theſe Inſtructions being thus made publick, many perſons, expecting great benefit from it in Husbandry, came to *Madrid* A. 1664. to buy this Inſtrument at the price of three *Rials of* 8. *Plate*; which then ſeemed a rate proportionable for the charge of making the Inſtrument, and the

Inventors gain. And ſo they made tryal in many parts of *Spain*, where they found the truth of what was promiſed by the Inventor, and diſcovered no other defect of the Inſtrument, than the ſlightneſs thereof, and its not being durable enough. To remedy which inconvenience, *Don Geronimo de Gamargo* was perſonally to view ſome grounds near *Madrid* ſowed by this Inſtrument, the better to inform his Majeſty of the Condition and ſucceſs of them, and how it was neceſſary ſomewhat to increaſe the price of the Inſtrument, that it might be made ſtronger and more durable. And His Majeſty was pleaſed to add one piece of 8. to the former price; whereby the Inſtrument is notably improved and bettered; the little Spoons, which at firſt were of Tin, are now of Braſs, and bigger than before, and more in number: The Wheels alſo are made bigger, and more ſubſtantial, and the Iron-plates likewiſe, together with the Nails of the Wheels, and Clouts of Iron and Rings of Braſs, to ſave the Axel-trees from wearing.

And that the Husbandman may the more underſtandingly uſe hereafter this *Sembrador*, and with greater eaſe, here are added more large *Inſtructions* than thoſe, that were publiſht the laſt year.

Larger Inſtructions for the Uſe of the New Sembrador.

1. Before they ſow the ground, they muſt give it ſo many tilths as is accuſtomed in that Country where the Land lyeth; concerning which tis needleſs to enlarge, ſince every ploughman knows it to be one of the fundamental rules for having a good Crop, to plough the ground three or four times, thereby to reduce the Land into mould, to kill and pluck out the weeds, and to break the clods.

2. When they go about to ſow, the Ploughman muſt begin to open a furrow with the Plough for one or two paces, and when the Plough is well in the ground in a convenient depth, then they muſt tye the *Sembrador* to the Plough-beam (as was mentioned above in the ſhorter Inſtructions,) ſo that the wheels and the nails in them ſtand upon the ground, and the bindings of the rings muſt be very hard, and in the manner expreſſed in the *Picture*: So ſhall the wheels move always, and the Inſtrumennt not reel, but move equally, whereby it will ſow with

better order and proportion: And this very ſtrong tying it to the Plough, ſo that it may not wreſt any way, will alſo make it ſow with the ſame order and equality over Hills, as alſo over rough uneven grounds, as over the ſmootheſt.

3. The Ears of the Plough are to be made larger, than hitherto; whence two advantages will ariſe: 1. It will better cover the furrows when ſown; and make wider furrows to receive the ſeed, when they do ſow. 2. Thoſe larger Ears will prevent the blows, the great Clods and Stones will give the *Sembrador* (if the Clods be not broken, and the Stones pick't out.) But when there are ſuch great Stones in the Land, as the Plough cannot penetrate, then the Plough-man by lifting up his plough muſt paſs over it, until he meets with mould again; and ſo muſt the *Sembrador* alſo be lifted up, the weight thereof being but very little, and no conſiderable trouble to the Plough-man

4. When the Clodds and Stones cannot be maſter'd with only one pair of Ears, you muſt add another pair of them to the Plough, four or five inches higher than the firſt (chuſing a fit place in the beam to place them in,) although behind the others a little; for ſo the *Sembrador* will be perfectly ſaved and defended. And the ſecond Ears are to be of the ſame bigneſs with the firſt. And this is found by Experience to be the beſt remedy againſt the Stones and Clodds.

5. The Time of Sowing, according to the moſt experienced Farmers, is, when the mould of the Land is dry, or but a little inclining to moiſture: In either of which conditions of the Land, this new *Sembrador* works without clogging the wheels, or ſtopping up with dirt thoſe holes, through which the grain is to iſſue forth. And to ſow land, when 'tis dirty and full of water, is very hurtful to the Farmer, who then looſes his Seed, and the pains of tilling, and the Crop. And this *Sembrador* may ſerve for a means to try, *when* the Land is in good temper to be ſown, *viz.* when the wheels of the Inſtrument will move equally, and without hindrance or clogging with dirt. And when the wheels will not turn round becauſe of the clay and over-much moiſture, it is a ſigne, that 'tis not fit for cultivation, until it ungive and be dry.

6. When 'tis time to ſow, the Corn muſt be very well clean'd, and eſpecially the Barley, as was noted in the former Inſtructions.

7. To know, when this *Sembrador* works beſt and moſt equally, you are to obſerve the quantity of Seed it ſows upon an *Hanega* * or half an *Hanega* of Land: for if it work as it ought to do, it will ſow three *Celamines* of Wheat (a little more or leſs) and five *Celamines* of Barley in every *Hanega* of Land. And if it much exceed or fail of this proportion, it noteth ſome fault in the Inſtrument, or careleſneſs in the Plough-man; which is very eaſy to diſcover, eſpecially from any impediment in the wheels, which ought always to turn round, and not to drag, becauſe upon their motion the Sowing wholly depends, and without it there will not one grain be ſowen.

* Hanega *is as much Land, (by the information of Inquiſitive Travellors in* Spain*) as will take about* $1\frac{1}{2}$ *buſhel of Engliſh meaſure, after the common way of ſowing.*

A Celamine *is about* $\frac{1}{12}$ *part of an Engliſh buſhel.*

And this care and obſervation muſt be in all other Seeds, proportionably to their bigneſs; noting that for the bigger ſort of Seeds, ſuch as are *Garavancas* (or Rounſifals) *Lupins* and other ſuch like, there muſt be *Sembradors* made with bigger Spoons; as there are to be made others with leſſer Spoons for the ſowing of *Rye, Millet*, and other leſſer Seeds.

8. How to manage the *Plough* in ſtiff or light ground, was noted in No. 3. of the former *Inſtructions*.

9. When you ſow, you muſt plough the furrows very cloſe one to another, that ſo the Plough, when it turns back, may the better cover the laſt furrow, which is left open, and ſow'd as it came along.

10. The Plough-beam and Plough-tail are to be governed ſtraight, without wrinching any way, that ſo the *Sembrador* may follow ſtraight, and without going awry, and ſow the grain in better order.

11. After having ſown the Land in the ſaid manner, the Land ſhould be made as plain as can be, and no ſuch furrows made to carry away the water, as hitherto hath been uſed; but it will be ſufficient, that at every four yards diſtance (one from the

other) furrows be made: For, Experience hath taught us, that the Land laid up without furrows bears more Corn, than that which hath more furrows; becauſe the Wheat and Barley, and other Plants receive greateſt damage by drought: And therefore this ought more eſpecially to be obſerved in *Spain*, one of the dryeſt Country of *Europe*.

12. In many parts of *Spain* in 1664. it was found, that Land ſown in *September* hath yielded a better Crop, then that which was ſow'd in *October*; and that ſown in *October*, better than that ſown in *November*: Which proveth, that 'tis more advantagious to ſow early, then late.

13. They have obſerv'd alſo, That it is very profitable to ſow in the *New Moon*, becauſe it will ſhoot forth, and thrive, and ripen ſooner. This is underſtood for thoſe, who till but a little Land, and ſo can chuſe their own time to ſow; but thoſe that plough great quantities, can loſe no time nor ſeaſon in ſowing. And in *Spain* they may begin the firſt *New Moon* in *September*, and ſo go on, and end with the *New Moon* in *November*. And in *Italy* they may do in the ſame manner, as alſo in the Iſlands of the *Mediterranean*. But in *Germany* and the *Low Countries*, they begin in the end of *Auguſt*, and end with the *New Moon* of *October*.

So far this Account. If any deſire to ſee this *Inſtrument*, he may inquire for the *Curator* of the *R. Society* (Mr. Hook,) or for their *Operator* Mr. *Shortgrave*, in *Greſham Colledg*, *the latter of whom will alſo, in all likelyhood, be ready to provide the Engin itſelf for thoſe, who ſhall pleaſe to make uſe of it.*

An Account of the Obſervation, made by the Philoſophical Academy at Paris, May 12 1667 *about* 9. *of the Clock in the morning, of an* Halo *or Circle about the Sun; together with a Diſcourſe of M.* Hugens de Zulechem, *concerning the Cauſe of theſe Meteors, as alſo that of* Parelia's *or Mock Suns. Engliſhed out of* French *by the Publiſher, to whom it was ſent but lately from the worthy Author of the ſaid Diſcourſe.*

THe Diameter of this Circle, which was exactly obſerv'd, was found to be of 44 degrees, and the breadth of the Limb thereof, of about half a degree. The upper and lower part were of a vivid red and Yellow, with a little purple-co-

Priſmes; as is evident by the *Tangents* A D, drawn to the Grain A, at the points, where the Ray D A enters or coms out.

Further he took notice, that it was alſo manifeſt, why the *red* colour is in the interiour circumference of the *Halo*. And why the ſpace, which it taketh in, and chiefly near the moſt lively colour'd parts, appears obſcurer than the Air about; *viz.* becauſe 'tis there, where *moſt* Grains are, which tranſmit no rays of the Sun to our Eyes, and ſo do nothing but darken the Air, as the drops of water when it raineth.

Moreover he noted, that M. *Des Cartes*, endeavouring to explain the Cauſe of theſe *Halo*'s, had committed a miſtake, for want of Obſervations, truly relating this laſt circumſtance: Becauſe he maintains, that the ſpace compriſed within the *Halo* is clearer than the Air without; and to render a reaſon of it, he ſuppoſeth certain Grains, *altogether* tranſparent, having the form of a lentil; which ſuppoſition cannot therefore be true, becauſe what he deduceth from it, is contrary to what is obſerved: Beſides that the roundneſs of the *Halo* in all the elevations of the Sun agreeth not with it, as were eaſy to ſhow.

He ſtayed not to examine the Generation of the half-dark grains, becauſe he is ſhortly to publiſh a larger Treatiſe of this ſubject; where he intends alſo to render a reaſon, why the dark kernel keeps certain proportions, rather than others, with the Grain, which contains it.

As to the Arch of the Circle, which above touched the laſt *Halo* ſeen *May* 12th, as alſo that the Colours were more vivid in this place, and in that below, then in the reſt of the Circle; he ſaid, that theſe effects did not proceed from the Grains, he had been ſpeaking of, but from another cauſe, which did alſo ſerve for the production of the *Parhelia* and the *Circles* which almoſt always accompany them.

Touching which *Circles* and *Parhelia*'s he told the Company, that beſides the round and half-dark Grains, there were alſo formed in the Air certain little Cylinders of the like nature, and of which M. *Des-Cartes* himſelf declared in his *Treatiſe of Meteors* to have obſerved ſome, not indeed with opaque kernels within, but that the ſame cauſe, which produceth them in the round grains, could alſo produce them in Cylinders: Which being ſuppoſed to be ſuch as the IV. Figure repreſents them, *viz.* oblong icy grains, and roundiſh at both ends, having the inner kernel of the ſame ſhape, it was found, that from their different diſpoſitions all the appearances of the *Parhelia* and their *Circles* did neceſſarily follow.

And *firſt*, that ſome of theſe Cylinders being erect, in the ſituation which probably they ought to have in being formed, there muſt appear in the Heavens a great white Circle, parallel to the Horiſon, paſſing through the Sun, and of near the ſame breadth with him; as hath been obſerved in the *Phænomenon* of *Rome* A. 1629. of which *Gaſſendus* and *Des-Cartes* have written, and which is here exhibited in the V. Figure. That this Circle L K N M is cauſed by the reflection of the rays of the Sun upon the ſurface of theſe Cylinders; it being eaſy to demonſtrate, that there are none but thoſe, which are raiſed at the ſame angle above the Horizon with that of the height of the Sun, that can reflect his rays to our Eye. Whence it manifeſtly follows, that it muſt appear White, and throughout of equal altitude with the Sun itſelf, and by conſequence parallel to the Horizon. That conſidering afterwards the Tranſparency of theſe perpendicular Cylinders, and their opaque kernels, it is eaſily ſeen, that thoſe of the white Circle, which are diſtant from the Sun at a certain angle, begin to give paſſage to his rays to ſtrike our eyes, in the ſame manner as hath been ſaid of the round half-dark Grains. That theſe Cylinders are thoſe, which on each ſide of the Sun make us ſee a *Parhelion* in the great white Circle, as hath been noted in the Obſervation of *Rome* (where they are mark'd with K and N) and in many others. That theſe *Parhelia* have commonly luminous tayles, becauſe the Cylinders, which follow thoſe firſt ones that form the *Parhelia*, and which are yet further diſtant from the Sun, let alſo paſs his rays to our Eye, ſo that theſe Tayles may be 20 degrees and more in length. That the ſame *Parhelia* are always colour'd, becauſe they are made by refraction, as the *Halo*.

That beſides, there are two other Images of the Sun, generated by theſe perpendicular Cylinders, and ſo diſpoſed in the great white Circle, that the Spectator, turning his face towards the true Sun, hath them behind him; as in the Roman Obſervation are the *Parhelia* L and M. That theſe are produced by two refractions and one reflexion in theſe Cylinders, in the ſame manner as the ordinary Rain-bow in the drops of water, according as M. *Des-Cartes* hath declared: So that the opaque kernels do nothing to the production of theſe two Suns, but that they may be ſometimes ſo big, as to make them not appear.

That according to the Altitude of the Sun, more or leſs, theſe two *Parhelia* are more or leſs nigh to one another; of which he promiſeth to give the true meaſures in his Treatiſe of *Parhelia*'s.

That they ſhould appear coloured, as the Rainbow, and that ſometimes they have been ſeen ſuch; but that when they are faint, they may alſo ſeem white, even as the *Halo*'s, when they are not very bright.

That theſe ſame perpendicular Cylinders can alſo produce an *Halo* about the Sun, by reaſon of the rounding of their two ends; which maketh, that being diſtant from the Sun at a certain angle, on what ſide ſoever it be, they begin from thence to give paſſage to the rays, tranſmitting them to the Eyes of the Spectator. And *that* theſe *Halo*'s are probably thoſe, we ſee almoſt always paſs through the two *Parhelia* that are on the ſide of the true Sun, as the *Halo* G K N I in the Phænomenon of *Rome*.

That there is yet an other ſcituation of theſe Cylinders very conſiderable, which is of thoſe that are couchant, ſo as their *axes* are parallel to the plan of the Horizon, but turn'd divers ways, ſome one ſome another way, like needles confuſedly thrown on the ground: Which Horizontal diſpoſition is very natural to thoſe Cylindrick Bodies, ſupported by the vapors, which riſe from the earth, as may be made out Experimentally in Bodies thus figur'd, being let fall in the Air.

That it is in theſe Cylinders, that the *Arches*, which touch the *Halo*'s above or below, are formed; ſuch as there were in the *Phænomenon* obſerv'd at *Rome* A. 1630, which is deſcribed

bed by P. *Schenir* in a Letter to M. *Gaſſendus*, as alſo in all thoſe, which *M. Hevelius* hath related at the end of his *Mercurius in Sole*. And *that* the Arch, which appear'd upon this laſt *Halo* at *Paris*, was of the ſame kind. *That* the figure of theſe Arches is different according to the different Altitudes of the Sun, and the ſeveral Magnitudes of the Diameters of the *Halo's*. *That* when the Sun is very nigh the Horizon, ſuch an Arch appearing upon an ordinary *Halo* of 44 degrees, muſt repreſent as twere two Horns, as in the VI. Figure, A B, A C: But that the Sun riſing higher, thoſe Horns become lower in proportion, and make ſuch Arches as are repreſented in the ſame VI. Figure, where each height of the Sun is mark'd near the Arch, which it is to make: Of which the Demonſtrations were reſerved to the ſame Treatiſe of *Parhelia's*.

That the place of the Arches where they touch the *Halo's*, being more ſtrongly enlightened and coloured than the reſt, maketh us Judge, that there are *Parhelia* in thoſe places.

That the reaſon, why theſe Arches do ordinarily touch a *Parhelion*, was, that the ſame Cylinders couchant, which produce the Arch, produce alſo that *Parhelion*, by the means of their two round and tranſparent Ends, in the ſame manner as hath been ſaid of the perpendicular Cylinders. And *that* the Parhelion laſt ſeen at *Paris* had been formed in theſe couchant Cylinders. *That* that was alſo confirmed, by reaſon that it was brighter in the ſuperior and inferior part, than any where elſe; which neceſſarily coms to paſs in a *Parhelion* cauſed by Cylinders thus diſpoſed, whereas when produced by the round Grains, it muſt appear every where equally ſtrong.

That in theſe ſame Cylinders parallel to the Horizon, there is alſo found the Cauſe of the *White Croſs*, obſerved together with the *Paraſelene's* or Mock-moons by M. *Hevelius*, and exhibited at the end of his *Mercurius in Sole*: the perpendicular *Fillet* of that Croſs, coming from the reflection of the rays of the Moon upon the ſurface of theſe Cylinders; as the other *Fillet*, parallel to the Horiſon, is produced by the reflection of the perpendicular Cylinders which make the great white Circle, of which this Fillet is a part. That yet the Moon muſt not be very high above the Horizon, to the end that the couvapors could keep ſuſpended a very great and weighty Circle of Ice, ſuch as M. *Des-Cartes* ſuppoſeth to explicate the cauſe of *Parhelia*'s and of the great White Circle of the Roman *Phænomenon.* In which ſuppoſition were alſo to be noted the following difficulties; *viz. That* therein there appears no reaſon, why the White Circle ſhould paſs through the Sun, as is always obſerved, and that it ſhould ſhade him according as he changes in height, though the *Phænomenon* do ſometimes laſt three or four hours: *That* this ſame White Circle, formed of Ice, being ſeen by Spectators diſtant enough from one another, could not appear round to all (as it doth) and to traverſe the Sun: *That*, when *Parhelia* are obſerved, there appears not at all this round Cloud encompaſſed with the Icy Circle, which by its thickneſs ſhould hide a part of the Heavens; but that the Weather ſeeems almoſt altogether ſerene, there being none but ſmal clouds, which are ſeen to change places, whilſt the great Circle and the *Parhelia* remain at reſt. *That* in this Hypotheſis it happens not but by chance, that the *Parhelia*, which are at the ſide of the Sun, appear in the Interſections of an *Halo* and of the great White Circle; which yet is obſerved to come to paſs always, and ſhews, that the Cauſes of theſe *Halo*'s and of the *Parhelia* are very little different, againſt the opinion of M. *Des-Cartes.*

A Diſcourſe of Dr R. Wittie, *relating to the Notes of* Dr Foot *in Numb.* 52. *and to thoſe of* Dr. Highmore *in Numb.* 56. *of theſe Tracts; concerning* Mineral Waters, *and* Extracts *made out of them: Communicated to the Publiſher, by way of Letter.*

Sir,

I Muſt always acknowledg myſelf much obliged to you for the reiterated mention you have been pleaſed to make of my Book in your *Tranſactions*, and your patient condeſcenſion to the trouble, that hath enſued therefrom to you, whereas I could not have any ground of hope, that any thing of mine ſhould have fallen under your notice. And this goodneſs of yours gives me encouragement to preſume at this time to deſire your favor in the peruſal of theſe lines, which are occaſioned from ſome Obſervations, I have met with in your ſaid *Tranſactions*, referring to my ſubject:

And *Firſt*, in N°. 51. p. 1039 *l.* 40. in mentioning the Principles of *Scarbrough-water*, there was pretermitted *Vitriol*, which I ſuppoſe was not deſignedly done. This I was to premiſe, becauſe ſome things that follow do refer to that Mineral.

Next, I cannot but take notice of D. *Foot*'s ingenious Notes and Letter in your *Numb.* 52. p. 1050: which he grounds upon your enlarged Account of my Book, about the Volatil parts of Mineral waters, together with his *Queries*. To all which though I might have returned a ſpeedy Anſwer from old Obſervations, yet I was willing to ſtay, till my occaſions could permit me to ſtep over to *Scarbrough* to renew my Experiments; wherein as I reſolved to be more Critical, ſo I hope my return will be more ſatisfactory to all, that are concerned.

As for *Tachenius*, to whom he refers, I cannot get him in *London*, and therefore can ſay nothing to his Principles. It is certain, that theſe ſorts of Mineral waters are more pleaſant to the palat, and alſo more effectual, if they be drunk at the Fountains, then when carried at diſtance: Yet ſome of them will endure carriage much better than others. Such of them, as are impregnated with a *body* of Minerals, as *Scarbrough*, *Malton*, and the *Sulphur-well* at *Knaresbrough*, will better indure carriage than the *Sweet-weell* at *Knares-brough*, and the *Sauvenir* in *Germany* &c. which have imbibed little or nothing but the *Volatil* Spirits or Vapors of ſome Minerals, which quickly evaporate, if removed from their Springs.

Now though *Scarbrough*-water will endure carriage as far as any I know, and yet retain its purging quality, even to many days or weeks, when it ſtinks, becauſe of its large proportion of Mineral Salts, which are not loſt by carriage, and will carry it through the Body; yet certain it is, that it ſuffers a great alteration and decay of vertue, being conveyed at diſtance; which probably muſt proceed from the loſs of ſome volatil parts; whereupon are alſo loſt ſome alterative properties, by which it ſhould fortify the *Craſis* of the Stomach and other Nervous parts, or open Obſtructions, or expel the Stone, *&c*: And thence it is, that I never ſaw a good cure done by it at diſtance. Nor can it be ſuppoſed, that theſe waters, which have in them a Body of Mineral Salts, can want thoſe Volatil Spirits, which others poſſeſs, that have no Minerals at all. Nay its plain, that even *Scarbrough*-water being drunk at the Town, which is but a quarter of a mile from the Spaw, hath nothing ſo pleaſant a reliſh upon the palat, as it hath at the Fountain(and ſome obſerve, its not ſo operative:) But whether that Alteration come from a ſudden loſs of any Spirits, I ſhall not haſtily determin, but do rather chuſe to make it out thus: It is ſuch an Alteration as we obſerve in Wine or Ale, which, after a while, looſes the briske taſte or reliſh, which it had being new drawn out of the Cask, whereby it is not ſo grateful to the Palat, while yet perhaps there is little or no loſs of any Vinous or Frumental Spirit; but then, after a day or two, it becoms whitiſh in Colour, and ſuffers ſome degrees of Putrefaction: Notwithſtanding I could never diſcern it to looſe of its quantity, as *Frambeſarius* and *Van Heer* do affirm concerning the *German*, as I have cited them p. 101. of my Anſwer.

Now, that I may yet more fully make out the truth of what I have aſſerted about the Principles of *Scarbrough-Spaw*, I here preſent to your view theſe ſeveral parts of it, with the manner of Extraction.

As touching the Vitriol, I muſt refer you to my Book, where I hope I have ſufficiently proved it to be one of them, eſpecially to p. 42, 43, 44; ſince, it being *there* principally in its Volatil parts, it cannot be ſo eſpecially repreſented to the ſenſes at diſtance, while yet it is moſt conſpicuous at the Well.

After Diſtillation or Evaporation of the Water, taken clear out of the Fountain, and ſtrained from all ſabulous mixture, there is found that Body of Minerals, ſigned A, *viz.* an ounce in five quarts, and in dry years, 10 drachms: Which I take to be the Product of the five Minerals, *Iron*, *Vitriol*, *Alome*, *Nitre* and *Salt*, which the water is impregnated withal, and ſeems to have a compound taſte of ſharpe Salt, acid, and ſomewhat ſtiptick; and indeed a *tertium* diverſe from them all.

Diſſolve this body of Minerals in pure Spring-water, or diſtilled water, and then filter it through Cap-paper, there will ſtay a little Inſipid Earth in the filter, but the water will be exceeding brackiſh. Evaporate that water away, and there remains the body, ſigned B, which being duly prepared, and time allowed (which I now have not) I have ſometimes ſeen to ſhoot into *Stiria's* an inch long, being ſet to Chryſtallize in a cold Cellar. This I Judge to be, for the greater part, *Niter*, reſembling much in taſte that *Niter*, which breaks out upon the Cliffe near the Well, mentioned p. 106. of my Anſwer.

Diſſolve again this Body in diſtilled water, and filter it, and the water ſhall be very brackiſh, but there ſhall remain in the filter the powder, ſigned C, which ſeems to be the *Aluminous* part: This is ſometimes found to be like a Chryſtallin ſand, as you have it in the paper, ſigned C C; I think, the difference in the ſhooting ariſeth from the different degrees of heat, which is given it. Evaporat this water away, and you have a *Salt*, mark't D, or that (D D;) the difference betwixt them is in the degrees of heat: In both which, if you note it, there are ſome ſmall *ſtiriæ*, which I take to be the *nitrous* particles interſperſed. This I have ſometimes depurated, till it hath become as white as Chalk, and yet retained its Saltneſs, as you have it ſigned D D D. Now, whether this Salt be from the Sea, or rather the Salt of all the minerals, I ſhall leave it to others to Judge; My opinion is, that it is nothing elſe than the product of the Minerals, which yet may receive ſome ſmall addition from the Sea.

When the *Spaw*-water is firſt ſet upon the fire, there falls to the bottom a yellowiſh powder, which, if that water be filtred, ſtays behind, mark't E: whether this be the ſame with the *Ochre*, that is found in the bottom of the veſſel, when the water is conveyed at diſtance, I cannot ſay; but they are both of a colour.

Here I had thought to have ſent you the *Black ſediment* (mentioned p. 66. of my Anſwer) which falls to the bottom of the veſſel, after the water hath received a tincture from the Gall, which alſo calcineth of a dark brown colour; which I take to be the *Iron Mineral*; but it being hard froſty weather, when I was laſt at *Scarbrough*, it would not ſeparate. If you deſire it, I ſhall ſupply it in Summer.

Now becauſe my Adverſary hath made a great ruffle about the Calcining of the Minerals, which he ſaith is White, and thereupon endeavors to exclude *Vitriol* and *Iron* from their number; I have ſent you ſome of them calcin'd, as they came out of the Crucible, ſigned F, which, you may ſee, have a manifeſt appearance of a red colour, (to uſe his own expreſſion, whoſe words I have cited p. 57. of my Anſwer:) Now ſince this Colour cannot be ſuppoſed to come from *Niter*, *Alom*, or *Salt*, it muſt, even upon his own principles, come from Vitriol, or Iron; and I judge it to come from *Iron*, which is there in its body.

And if you take the body of Minerals, which we firſt ſpake of to be found in the *Spaw-water*, and calcine it, and ſo rub it into a fine powder, and then edulcorate it in pure or diſtilled water, and afterwards filter it, you ſhall find a nitrous Salt, not much different from what was expreſſed before, mark't B, and the other following parts alſo; but a larger quantity ſtays always in the filter, chryſtallized through the more vehement heat of the fire.

But there are other parts, which I fetch out of this body of Minerals, which doubtleſs do much contribute to the Cures performed by this water, and uſed with other vehicles are of ſingular uſe in Hypochondriack diſeaſes. I took ſix ounces of the Minerals, which I put into a Retort, and placed it in a furnace covered with Sand, increaſing the fire gradually, the Receiver being cloſe joyned to the Retort, and ſo luted, as not the leaſt Volatil ſpirit could evaporate. *Firſt*, came this in the Glaſs, ſigned G, about an ounce in quantity, which is the *Phlegm.* Then with another Receiver, as well luted, the heat increaſing, came the acid Spirit, ſigned H, near half an ounce in quantity. I have ſometimes found it much more ſharpe and acid than this is, and indeed I took it too ſoon away from the fire: Yet this giveth a Tincture to a decoction of Roſes, like Spirit of Vitriol or Salt. I have ſometimes obſerved this ſharpe ſpirit like Spirit of Vitriol, to chryſtallize to the ſides of the glaſs, when it hath been long kept, and looſing its acidity to become like the phlegm.

I now come to the *Queries* of D. *Foot*, to which I ſhall ſpeak as to matter of fact, refering the Reaſon of things to be diſcuſſed by better heads.

To the *firſt*, I diſtilled *Scarborough* Spaw-water in a Glaſs-ſtill, luting the Receiver ſo cloſe, that no ſpirit (even of wine) could eſcape me, and it yielded nothing but an inſipid water, as ordinary Spring-water uſes to do: And I think, I may confidently affirm, that none of thoſe Mineral Springs will afford any other.

To the *Second*, The water of *Scarbrough*, and all ſuch as are impregnated with a body of Minerals, whether they be let ſtand, or conveyed at diſtance do let fall a yellowiſh ſediment in time. But ſo it is not in *Knareſbrough* ſweet-well, nor ſuch others as have no Minerals, but have onely imbibed the Vapors or Odors of ſome Mineral.

To the *third*; When ſuch waters are moved by carriage, they do ſooner precipitate that yellow ſediment to the bottom, and eſpecially if conveyed in oaken veſſels.

To the *fourth*; This yellowiſh ſediment is plainly diſcernable both in their Spring-heads and ſtreams; nay, even *Knaresbrough* water doth a little colour the Ciſtern in tract of time, notwithſtanding it hath very little of the ſubſtance.

To the *fifth*; Thoſe bottles that are ſtop'd cloſe, whether they be moved or not, will longer keep their brisk reliſh, than ſuch as are left open, and alſo longer retain their medical vertues, together with their colour and ſediment.

To the *ſixth*; I find not any difference in the Veſſels, wherein *Scarbrough*-water is put, *viz.* a Glaſs-bottle or an Ox-bladder, ſave this, that that which was in the Bladder would not receive ſo black a tincture from the Gall, as the other, but rather a Claret.

To the *ſeventh*; I could never yet deviſe, nor any other I have met with, to prevent the loſs of the aperient vertue of *Scarbrough*-water, nor to hinder the precipitation of the yellow ſediment, if removed at diſtance.

To the *eighth*; Notwithſtanding that *Scarbrough*-water lets fall the *Ochre*, yet it remains Purgative, from the reſt of the Mineral Salts and Spirits, which yet it retains even till, and when it ſtinks: And perhaps being fetid it may purge the more, as ſome have told me, who have drunk it, when they have been forced to ſtop their noſes, though it hath been with very much prejudice to their health, as I have made out in my former Book, to wit *Scarbrough-Spaw*, (Edit. 2. p. 220, 221.) But as for *Knaresbrough* Sweet-well, *that* will be found enervated, though no *Ochre* appear in the bottom.

To the *ninth*; That of *Knaresbrough*, and ſuch like, are better explicated, to have loſt their vertues by an Avolation of Spirituous parts, ſince they have nothing elſe wherein the vertue can conſiſt: whereas it will not ſerve for *Scarbrough*, from which theſe ſpirits cannot in reaſon be excluded; nay they are found more eminently in the Minerals, And therefore we muſt allow to it, and to ſuch like, an inteſtine Alteration, or Precipitation alone upon the Rock will, by the Summer heat be turn'd into *Iron*, and then he makes inference upon the *Hypotheſis*. Which is a miſtake; for I do not ſay ſo in any part of my Book; but p. 45. I do ſay, that ſome of that which is like ordinary Earth, falling down, turns to an *Iron-ſtone*, and is fuſible in the fire.

In the next Sect. he is poſitive about the colour of *Roman* Vitriol, which I ſaid to be factitious. Concerning this, I find Authors much differing. *Galen* (l. 9. de ſimpl. med. fac.) mentions 3. ſorts which he found at *Cyprus*, and tells of a *green* ſort, but not a word of *blew*. So Dr. *Jorden*, c 7. Indeed *Schroderus* and *Adrian Toll* ſpeak of a *blew* ſort. In this diſſent of Writers, I conſulted ſome Learned and obſerving Gentlemen, who had been at *Rome*, and they aſſure me, that the *Romans* adde that colour, when they caſt it into forms. Moreover if that be a right diſtribution of *Vitriols* into their ſeveral kinds, which ſome of our modern Chymiſts make, *viz.* that there are but three ſorts, Vitriol of *Iron*, of *Copper*, and *White* Vitriol, then, I think, it will follow, that I am in the right; for, one is yellow, *viz.* that of *Iron*, the other green, and the white is that, which is made blew. But 'tis not worth the while to contend about it.

In my 120 p. he ſaith, I am diſſatisfied with what my Adverſary aſſerts concerning the Saltneſs of the Sea proceeding from *Foſſil* Salt, *&c.* but rather that I allow the Peripatetical Torrefaction of the Sun to be the Cauſe. All I ſay there, is, that the *Peripateticks* thought, it came ſhort of an adequat cauſe, and thereupon they fly to that torrefaction; but it does not therefore follow, that I allow it. The truth is, I like neither of the Opinions, but have Arguments againſt them both. To ſpeak out, I rather think, the Saltneſs of the Sea to be connatural to it (as the freſhneſs of other water is to it) and that it was made ſo from the beginning, but that I reſerved for another diſcourſe.

As for the Argument which there I brought to back my aſſertion, *viz.* That if the Salt of the Sea ſhould come from *foſſil* Salt, it would kill the Fiſh, he ſaith, it is not convincing. This I ſeconded by an Inſtance concerning the *Salt-Sea*, which kills all fiſh, and thence is called *Mare mortuum:* Which, I think, is of greater force to confirm it, than the Doctors inſtance of Oyſters, which he has experimented to be preſerved by Salt and water, can be to contradict it. For thoſe *Zoophyta* have but a dull and imperfect life, and are not ſo proper to be drawn into inſtance in our caſe. We know, they will keep a long time in their own pickle or moiſture, and we have alſo known them to ſtink, notwithſtanding the addition of Salt and water, and therefore little judgment can be taken from them. It is moſt certain (as he obſerves) that the Inland Salt-ſprings are *ſuch* from foſſil Salt, and it were worth trying, whether thoſe Salt-ſprings would not kill a *Pilchard*, or any other ſort of Sea-fiſh, that liveth a perfect ſenſitive life: but, I fear, Sir, I have been too tedious. You will, *&c.*

An Accompt of ſome Books.

I. *The* DIVINE HISTORY *of the* GENESIS of the *WORLD, explicated and illuſtrated*, London 1670. in [illegible]

THis Author (not thinking fit to give us his Name) taketh no ſmall pains to explain in this his Book the *Geneſis* of the *World*, as tis delivered by *Moſes*, eſteemed by him the only true Philoſopher. In doing which, he yet profeſſes, that he diſſents not from the *Pagan* Philoſophy out of a Spirit of Contradiction, or to flatter Chriſtianity, but retains whatever of truth he hath found therein, and all the aids of the ſame, whether they be *Platonical* Speculations, *Peripatetical* Ratiocinations, or *Epicurean* Senſations, and even *Sceptical* Caution it ſelf; affirming, that he is *Dogmatical* only in ſuch Poſitions, as he proves by the concurrence of Divine Authority, Human Argument, and Senſible Experiment.

In his *Preface* he ſeems not to be a little diſpleaſed to hear ſome *Chriſtian* Philoſophers affirm, that the very Eſſences and Formalities of all Elementary, Vegetative and Senſitive Natures, are only *Matter* and *Motion*.

In the Body of the Book he endeavors to demonſtrate, that the World had a Beginning, and labors to diſprove the poſſibility of the Worlds being *ab æterno*.

Then, he attempts to give us from the firſt Chapter of *Geneſis* a Body of Natural Philoſophy, diſcourſing of the *Chaos*, the Four Elements, Quantity, Number, Time, Extenſion, Figure, Poroſity, Denſity, Rarity, Gravity, Levity, Reſt, Motion, Place, Space, and Vacuity, (which laſt he rejects, ſhewing himſelf withal a great friend to *Motion* of *Union*;) further of Generation and Corruption and the Proceſſe thereof, together with a Scale and Order of all Generable and Corruptible Natures. Then he proceeds to treat of Heat, Light, Colours, the Air and its Elaſticity; where he examines the *Torricellian* Experiment, not admitting that to be an Inſtance of Vacuity, but eſteeming, that a great force of Introſuction (ſo he calls it) makes temporary pores and pervious paſſages; by which the Air paſſes through the Body of *Mercury* it ſelf into the Tube, and thereby is ſo very much expanded.

After this he conſiders Cold, Sound, Meteors, Water, Odors, Sapors, the Flux and Reflux of Waters, preſenting withal his *Hypotheſis* of *Tydes*, and aſſigning certain *Criteria*, to try its truth by; which done, he goes on to treat of the Earth, and of what is contained in the Bowels thereof; handling alſo of Drineſs, Conſiſtence, Magnetiſme, and Electricity: Further he ſhews himſelf a great Favorer to the *Reſt* of the Earth; and having taken great pains to aſſert the ſame (how ſucceſsfully, good Aſtronomers may judge) he paſſes on to diſcourſe of Vegetables; then of the Celeſtial Bodies, and among them of *Comets*, which he ſuppoſeth to be made up of the *Æthereal Effluvia* of the Luminaries, or the *Confluvia* of the Æthereal matter; as *Aereal* Meteors are made of Vapors.

Further, he diſcourſes of the Formation of Fiſhes and Fowls; then, of Senſation, Imagination, Appetite; Beaſts, Man, Human Body, Human Spirit, the Image of God in Man, and the Immortality of the Human Soul: where he repreſents Man as the Centrick Orbe of the whole World, making him the *Abſtract* thereof, and that one Nature, which all other Creatures do circumferentially reſpect, relating to him one way or another, as ſo many lines in a Circle to the Center.

In the Cloſe, he obſerves two things:

1. The Symmetrical and Uniform *Chorography* of the whole Maſſe of Matter, and of the ſeveral parts thereof, exactly adjuſted according to the more or leſs Denſity of their Matter, and the more or leſs Activity of their Qualities; *viz.* the *Super-æther* (as he terms it) or the utmoſt Circumference of the World; and within that, the *Æther*; and within this, the *Air*; and within them all, the *Terraqueous Globe*, and inmoſt Center thereof.

2. The eaſie Comprehenſion of the *Age* of the World, according to the Moſaical *Chronology*; there being in that not above 150 Generations between *Us* and *Adam*, in regard that that Sacred Writing enumerateth, from *Adam* to *Chriſt* incluſively, no more than 76 Generations; and allowing 4 Generations to every Century ſince the Nativity of Chriſt, the Total will not exceed the number above-ſpecified.

II. *FRANC. TRAVAGINI, Super Obſervationibus a ſe factis tempore ultimorum* Terræ-Motuum, *ac potiſſimum* Raguſiani, *PHYSICA DISQVISITIO, ſeu, GYRI TERRÆ DIVRNI INDICIVM.* Lugduni Batavorum, 1669. in 4o.

This *Venetian* Philoſopher acquaints the Curious in this Book with ſome Obſervations, made by himſelf in two late Earth-quakes, and by others alſo, in the laſt about *Raguſa*, whence he thinks an Argument may be drawn to confirm, among other proofs, the *Diurnal Motion* of the *Earth*.

His Obſervations are, that in thoſe Earth-quakes himſelf did find, beſides a *ſubſulting* perpendicular motion, found by others, a concomitant *Lateral* one, from *Weſt* to *Eaſt*; which latter he conceives was not cauſed by the former, (which he alſo endeavors to prove) but only diſcovered by it: juſt as the progreſſive Motion of a Boat, carried with a ſtill ſtream, is not produced, but only made ſenſible, from an accidental check, to a perſon, that ſhall have been put in it aſleep, when it was at reſt, but awakens, after it was made to ſwim down a ſtill River; who will think himſelf un-moved, till the Boat meet with ſome ſtop, whereby for the time its courſe will either be hindred, or diſturbed, and he made ſenſible of his being in motion.

He alleges divers other Obſervations, made of Rivers, ſuſpended Bells, and Church-Lamps, which were all obſerved by himſelf and many others to have likewiſe the ſaid lateral and vibrating motion. Whereupon he admoniſheth his Readers, that they would, on the like occaſions, take very particular notice of all the ſeveral motions in Earthquakes; and then conſider with themſelves, whether from ſuch Obſervations, univerſally made, importing, that the Earth in Earth-quakes is vibrated towards the Eaſt, and that that Vibration cannot proceed from its ſuccuſſation, (which is onely able to cauſe a perpendicular motion in the trembling Earth.) it may be validly inferred, that the Earth hath a Diurnal Progreſſive Motion from Weſt to Eaſt.

III. *QUÆSTIO TRIPLEX De ANNO MENSE & CHRISTI NATI, BAPTISATI & MORTUI.*

R. P. Michaele Seneſchallo *è S. J. Leodii*, 1670. in 4°.

THis Author undertaketh to prove in this Chronological Treatiſe not only the Year and Month, but alſo the Day and Hour of the *Nativity* of Chriſt, and of his *Baptiſme* and *Death*. In the doing of which he maketh diligent reſearch of all Writers of Chronology in general, and then examins particularly the Variety of their Opinions concerning the Subject under Conſideration; diſcovering much Induſtry and Learning in all theſe Inquiries.

IV. *HERMANNI GRUBE*, M. D. *Commentarius de Modo SIMPLICIUM MEDICAMENTORUM FACULTATES cognoſcendi.* Hafniæ & Francofurti, 1669. in 8°.

TO this Treatiſe is prefixed an Epiſtle of Doctor *Thomas Bartholin* concerning this very Book and Argument; by which it appeareth, that this Author is not contented with *Ariſtotle* to enquire, Why bitter or ſtrong-ſented Medicaments and Plants do moſtly purge, and fragrant ones provoke to urine; nor with *Galen*, to find out their Vertues by the Colour, Smell and Taſte, but proceeds to particular Experiments, and examines alſo, How and upon what account the Vertues of Plants are diſcoverable by the Smell and Taſte; deſcending to the conſideration of the ſeveral Particles, Figures, and Pores, upon which the diverſity of thoſe Senſations depends; and ſuper-adding the Experiments of ſober *Chymiſts*, and the Principles of the *Carteſian* Philoſophy, to thoſe of *Ariſtotle* and *Galen*

Mean while the Learned *Bartholin* commends very much the knowledge and uſe of ſimple Native Medicins, eſpecially prepared of *Domeſtique* Plants, and directs to ſuch at home, as may perform the part of *Exoticks*. VVhere he ſpecifieth the uſe of European *Dock* inſtead of *Rhubarb*; of *Elder* inſtead of *Sena*; of *Cumphry* inſtead of *Mechoacan*; of *Iris* inſtead of *Jalap*, &c. For Purgatives he finds at home *Green Barley*; the Powder of *St. John's Wort*, &c. He taketh our *Wallnuts* to be a *Succedaneum* to *Nutmegs*; the Root of *Angelica* to *Coſtus*; *Scordium* or Penny-Royal to the *Dictamne* of *Crete*; the *Sap* of *Firr*, to *Opobalſamum*; the *Geranium Moſchatum*, or ſweet ſented *Cranes-Bill*, to the Indian *Musk*, &c.

Having done this, he maketh a Reflexion on the Indications taken from Plants by their Taſte, and obſerveth, that though much may be thence collected, yet Experience is the Chief Maſter of all: where he diſdains not to recommend even to great Phyſicians

ſicians the uſe of ſimple Medicins made of Herbs, uſed by plain Countrey-men, Nurſes, Farriers, *&c.* affirming, that the chief of the Antient Phyſicians, as *Celſus*, *Scribonius*, *Marcellus*, *Dioſcorides* and others have done ſo.

He taketh notice, *Firſt*, That the external likeneſs in ſome Plants is not to be altogether deſpiſed; affirming, that from thence it was diſcovered, that our *Aſhwood*, like to *Guaiacum*, is conducive to the *Lues Venerea*, and other Maligne Diſeaſes. *Secondly*, That neither the outward Signature is to be totally neglected; ſince the Antients thereby did firſt diſcover, that *Hypericum* was good for wounds; *Pulmonaria* for the Lungs; *Saxifraga*, for the Gravel; *Walnuts* for the Diſtempers of the Head. Where he notes, that theſe ſignes do not ſo much reſpect the parts of the Body, as their Diſtemper.

He concludeth with obſerving, that thoſe Plants which afford Salts of the like Figure, ſeem to evince a likeneſs in their Vertues. Upon this accompt he compareth together *Wormwood* and *Pellitory on the Wall*; *Baulm* and *Fennel*; *Licoriſh* and *Capillus Veneris*; *Roſemary* and *Bugloſſe*, &c.

The Treatiſe it ſelf, to which this Epiſtle is an Introduction, is directed to Medical Practice, and enlarged with divers uſeful Obſervations for the ſake of young Phyſicians.

V. DE LACTE LUNÆ *Diſſertatio Medica*, Johannis Danielis Majoris, *Ph.* *&* *M. D.* Kiloni 1667 *in* 4°.

THis Book came but very lately to our view; And that the extravagant Name of its Subject may not take off ſober men from conſidering it, we ſhall at the very firſt tell them, that by this affected word of *Lac Lunæ* nothing elſe is meant here, than *Flores Argenti*, or a fine white porous and friable Earth, inſipid and without ſcent, diſſoluble in water, and tinging it with a milky colour, and ſometimes raiſing a kind of ebullition in it; found commonly in Silver-Mines, and in them ſublimed and ſticking to the roofs of the rocky Hills; having a drying and abſterſive quality, and therefore good againſt the afflux of ſharp humors in ulcerated parts; ſerving alſo for an excellent *Coſmetick*. All which particulars are at large deduced and diſcourſed upon by the Author; who obſerveth, *firſt*, That *Geſner* in his Book of *Foſſils* taketh good notice of this Mineral Earth; and affirms it to be found in the Mountains of *Helvetia*, eſpecially that, which is called *Mount Pilat*. From whom he thinks that others, as *Boethius à Boot*, *Olaus Wormius*, *Aldrovandus*, *Calceolarius*, and others, have taken the hint.

Secondly, He maketh the matter of this Earth to be the Metallick Vapors of Silver-Ore, by ſome fermentation raiſed and ſublimed, and then condenſed.

Thirdly, Having commended its *Abſterſive* and *Coſmetique* quality, he giveth this following *Recipe*;

Lact. Lunæ Drachm. VII.
Laccæ Virginian. vel Florentin. *Drachm.* I.
Moſchi optim. gran. II. *vel* III.
Miſc. exacte, *fiat pulvis ſubtilis.*

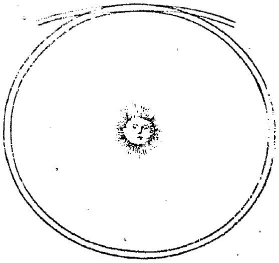
which Powder, *he ſaith*, when 'tis to be uſed for the face or hands, may, for more conveniency, be moiſtened with ſome Eſſence of *Benzoin*, *Roſe-water*, or *Orange water*; whereby the skin ſhall acquire a natural and florid whiteneſs, without any danger of miſchief.

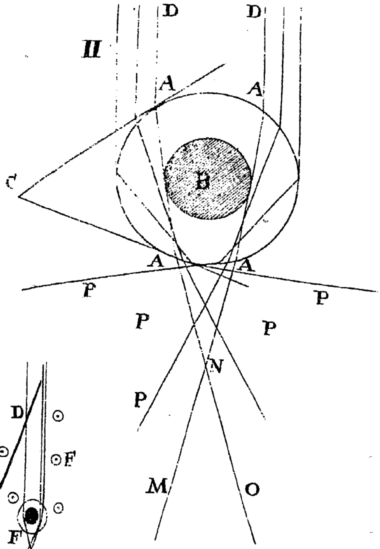
Fourthly, Inquiring into the particular places of the Generation of this Earth, he affirms it to be found, as in the above-named Mountains of *Helvetia*, ſo in the Mines of *New Spain*, and about the *Mexican Bay*, as alſo about *Peruſium* in *Italy*, in an Iſle near *Hamborough*, called *Heilige Land*, belonging to the Duke of *Holſtein*, and in *Sileſia* near *Bruſnitz*.

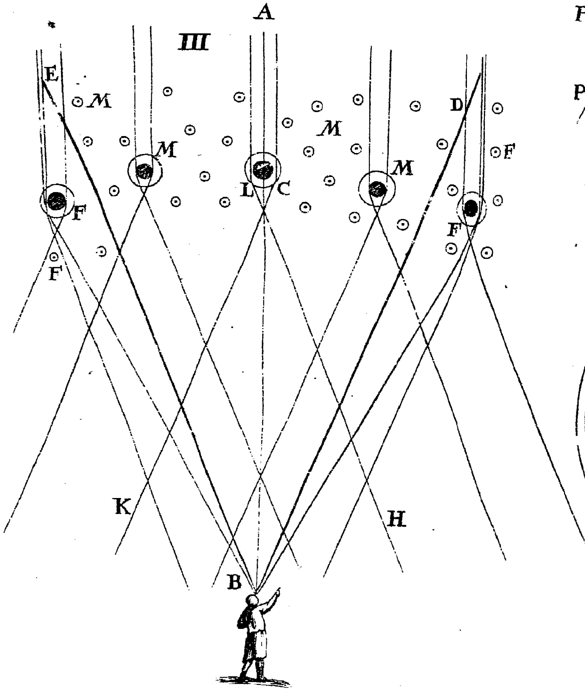
Errata, In Numb. 58. p. 1186. l. 17. r. *to remove*, p. 1192. l. 12. r. *at Franchin.* p. 1200. l. 16. r. *before noon.*
In Numb. 59. p. 1041. l. 19. r. *Pupilla which dilates*, p. 1045. l. 20. r. *pipe, I took.*

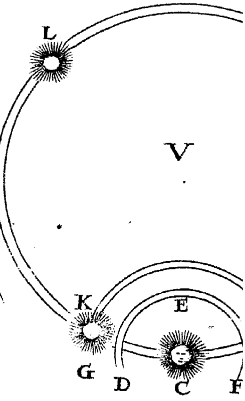
LONDON,
Printed by *T. N.* for *John Martyn* Printer to the *Royal Society*, 1670.

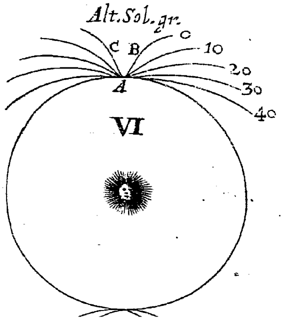
Tab. 2.

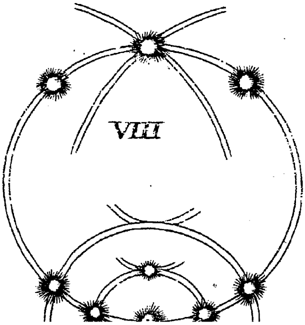

I

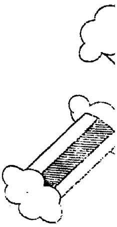

D
D
II
A
A
C
B
A
A
P
P
P
P
P
N
M
O


A
III
E
M
M
M
M
D
F
L
C
F
F
F
K
H
B


L
V
K
E
G
D
C
F


Alt. Sol. gr.
C
B
0
10
20
30
40
A
VI


VIII



Numb. 61.

PHILOSOPHICAL TRANSACTIONS.

July 18. 1670.

The CONTENTS.

A Letter of Doctor John Wallis *to* Robert Boyle *Eſq;* *concerning the ſaid Doctors Eſſay of Teaching a perſon* Dumb *and* Deaf *to* ſpeak, *and to* underſtand a Language; *together with the ſucceſs thereof, made apparent to his Majeſty, the Royal Society, and the Univerſity of* Oxford. *A Relation concerning the* Sal-Gemme-Mines *in* Poland, *deep* 200 *Fathoms. The way of making* Vinegar *in* France. *An Accompt of ſome Books*: I. *MECHANICA ſive De MOTU Tractatus Geometricus; PARS SECUNDA, in qua De CENTRO GRAVITATIS Ejuſque CALCULO, Auth.* Johanne Wallis *S. Th. D. & Geometriæ Prof. Saviliano, &c.* II. *EXERCITATIONES MECHANICÆ,* Alexandri Marchetti. III. *The Natural Hiſtory of NITER, by* William Clark.

A Letter of Dr. John Wallis *to* Robert Boyle *Eſq, concerning the ſaid Doctor's Eſſay of Teaching a perſon* Dumb *and* Deaf *to ſpeak, and to* Underſtand a Language; *together with the ſucceſs thereof: Which Letter though written many years ſince, was but lately obtain'd to be inſerted here, it being eſteemed very well worth to be preſerv'd and communicated for Publick Uſe.*

SIR,

I Did acquaint you a while ſince, That (beſide the conſideration of.........., which I had in hand;) I had undertaken another Taſk, (almoſt as hard as to make Mr. ...... underſtand Reaſon,) to Teach a perſon *Dumb* and *Deaf*, to *Speak* and to *Underſtand a Language*. Of which if he could do either, the other would be more eaſy: But his knowing neither, makes both harder. And though the Former may be thought the more difficult; the Latter may perhaps require as much of Time. For if a conſiderable Time be requiſite, for him that can ſpeak One, to learn a Second Language; much more for him that knows None, to learn the Firſt.

I told you, in my laſt, that my *Mute* was now at leaſt *Semivocalis*, whereof becauſe you deſire a more particular Information, I thought my ſelf obliged to give you this brief Account of that whole Affair: that you may at once perceive, as well, upon what conſiderations I was induced to Attempt that Work, and what I did propoſe to my ſelf as Feſible therein, as what Succeſs hath hitherto attended that Eſſay.

The Taſk it ſelf conſiſts of Two very different parts; each of which doth render the other more difficult. For, beſide that which appears upon the firſt view, To teach a perſon who *cannot Hear*, to *Pronounce the Sound of Words*: There is that other, of teaching him to *Underſtand a Language*, and know the ſignification of thoſe words, whether ſpoken or written, whereby he may both expreſs his own ſenſe, and underſtand the Thoughts of others: without which latter, that former were only to ſpeak like a Parrot; or to write like a Scrivener, who underſtanding no Language but Engliſh, tranſcribes a piece of *Latin*, *Welſh*, or *Iriſh*; or like a Printer of Greek or Arabick, who knows neither the ſound nor ſignification of what he printeth.

Now, though I did not apprehend Either of theſe impoſſible; yet, that each of them doth render the other more hard, was ſo obvious as that I could not be Ignorant of it. For, how eaſily the underſtanding of a Language is attain'd by the benefit of Diſcourſe, we ſee every day; not onely in thoſe, who knowing one Language already, are now to learn a ſecond; but (which doth more reſemble the preſent caſe) in Children, who as yet knowing none, are now to learn their Firſt Language.

For it is very certain, that no Two Languages can be ſo much different the one from the other, but that the knowledge of the one will be ſubſervient to the gaining of the other: not only becauſe there is now a common Language, wherein the Teacher may Interpret to the Learner the ſignification of thoſe Words and Notions which he knows not, and expreſs his own Thoughts to him; but likewiſe (which is very conſiderable,) becauſe the *common Notions of Language*, wherein all or moſt Languages do agree, and alſo ſo many of the Particularities thereof as are common to the Language he knows already, and that which he is to learn, (which will be very many,) are already known; and therefore a very conſiderable part already diſpatched, of that work which will be neceſſary for the teaching of a Firſt Language, to him who as yet knows none.

But to this diſadvantage (of teaching a Firſt Language,) when that of *Deafneſs* is ſuper-added, it muſt needs augment the difficulty: ſince it is manifeſtly evident from Experience, That the moſt advantageous way of teaching a Child his Firſt Language, is that of *perpetual Diſcourſe*; not onely what is particularly addreſſed to himſelf, as well in pleaſing divertiſements, or delightful ſportings, (and therefore inſinuates it ſelf without any irkſom or tedious labour,) as what is directly intended for his more ſerious Information: But that diſcourſe alſo which paſſeth between others; where, without pains or ſtudy, he takes notice of what Actions in the Speaker do accompany ſuch words, and what Effects they do produce in thoſe to whom they are directed; which doth, by degrees, inſinuate the intendments of thoſe words.

And, as that Deafneſs makes it the more difficult to teach him a Language: ſo on the other hand, that want of Language, makes it more hard to teach him how to ſpeak or pronounce the Sounds. For there being no other way to direct his Speech, than by teaching him how the Tongue, the Lips, the Palate, and other Organs of ſpeech, are to be applyed and moved in the Forming of ſuch ſounds as are required; to the end that he may, by *Art*, pronounce thoſe

Sounds, which others do by *Cuſtome*, they know not how; it may be thought hard enough to expreſs in writing, even to one who underſtands it very well, thoſe very nice Curioſities and Delicacies of motion, which muſt be obſerved (though we heed it not,) by him, who without help of his Ear to guide his Tongue, ſhall form that variety of Sounds we uſe in ſpeaking: Many of which Curioſities are ſo nice and delicate, and the difference in forming thoſe Sounds ſo very ſubtile, that moſt of our ſelves, who pronounce them every day, are not able, without a very ſerious conſideration, to give an account, by what Art or Motion our-ſelves form them; much leſs to teach another how it is to be done. And if, by writing to one who underſtands a Language, it be thus difficult to give Inſtruction, how, without the help of Hearing, he may utter thoſe Sounds, it muſt needs increaſe the Difficulty, when there is no other Language to expreſs it in, but that of Dumb ſigns.

Theſe Difficulties (of which I was well aware) did not yet ſo far diſcourage me from that undertaking, but that I did ſtill conceive it poſſible that both parts of this Taſk might be effected.

As to the Firſt of them; Though I did not doubt but that the Ear doth as much guide the Tongue in ſpeaking, as the Eye doth the Hand in writing, or playing on the Lute: and therefore thoſe who by accident do wholly loſe their Hearing, loſe alſo their Speech, and conſequently become Dumb as well as Deaf; (for it is in a manner the ſame difficulty, for one that Hears not, to ſpeak well; as for him that is blind, to write a fair hand:) yet, ſince we ſee that 'tis poſſible for a Lady to attain ſo great a Dexterity, as, in the dark, to play on a Lute, though to that variety of nimble motions, the Eyes direction, as well as the Judgment of the Ear, might ſeem neceſſary to guide the Hand; I did not think it impoſſible, but that the Organs of Speech might be taught to obſerve their due Poſtures, though neither the Eye behold their Motion, nor the Ear diſcern the Sound they make.

And as to the other; That of Language might ſeem yet more poſſible. For, ſince that in Children, every day, the Knowledge of words, with their various Conſtructions and Significations, is by degrees attained by the Ear; ſo that, in a few years, they arrive to a competent ability of Expreſſing themſelves in their firſt Language, at leaſt as to the more uſual Parts and Notions of it; Why ſhould it be thought impoſſible, that the Eye (though with ſome diſadvantage) might as well apply ſuch Complication of Letters or other Characters, to repreſent the various Conceptions of the mind; as the Ear, a like Complication of Sounds? For though, as things now are, it be very true that Letters are, with us, the immediate Characters of Sounds, as thoſe Sounds are of Conceptions: yet is there nothing, in the nature of the Thing it ſelf, why Letters and Characters might not as properly be applyed to repreſent Immediately, as by the Intervention of Sounds, what our Conceptions are.

Which is ſo great a Truth, (though not ſo generally taken notice of,) that 'tis Practiced every day; not onely by the *Chineſes*, whoſe whole Language is ſaid to be made up of ſuch Characters as to repreſent Things and Notions, independent on the Sound of words; and is therefore differently ſpoken, by thoſe who differ not in the Writing of it: (like as what, in Figures, we Write, 1, 2, 3, for *One, Two, Three*; a Frenchman, for example, reads *Un, Deux, Trois*:) But, in part, alſo amongſt our ſelves; as in the Numeral Figures now mentioned, and many other Characters of Weights and Metals, uſed indifferently by divers Nations to ſignifie the ſame Conceptions, though expreſſed by a different Sound of words: And, more frequently, in the practice of Specious Arithmetick, and operations of Algebra, expreſſed in ſuch Symbols, as ſo little need the Intervention of Words to make known their meaning, that, when different perſons come to expreſs, in Words, the ſenſe of thoſe Characters, they will as little agree upon the ſame Words, though all expreſs the ſame ſenſe, as two Tranſlators of one and the ſame Book into another Language.

And, though I will not diſpute the Practical poſſibility of introducing an *Univerſal Character*, in which all Nations, though of different ſpeech, ſhall expreſs their common Conceptions; yet, that ſome Two or Three (or more) perſons may, by conſent, agree upon ſuch Characters, whereby to expreſs each to other their ſenſe in Writing, without attending the Sound of words; is ſo far from an impoſſibility, that it muſt needs be allowed to be very Feſible, if not Facile. And, if it may be done by new-invented Characters; why not as well by thoſe already in uſe? Which though to thoſe who know their common uſe, may ſignifie Sounds; yet to thoſe that know it not, or do not attend it, may be as immediately applied to ſignifie Things or Notions, as if they ſignified nothing elſe: And conſequently, ſo long as it is purely Arbitrary, by what Character to expreſs ſuch a Thing or Notion; we may as well make uſe of that Character or Collection of Letters, to expreſs the Thing to the Eyes of him that is Deaf; by which others expreſs the Sound or Name of it to thoſe that Hear. So that, indeed, that ſhall be, to Him, a Real Character, which expreſſeth to Another a vocal Sound; but ſignifieth, to Both, the ſame Conception: Which is, To underſtand the Language.

To theſe Fundamental Grounds of Poſſibility in Nature, I am next to add a Conſideration which made me think it Morally-poſſible; that is, not impoſſible to ſucceed in Practice. And, becauſe I am now giving an Account to one who is ſo good a Friend to Mathematicks, and Proficient therein, I ſhall not doubt but this Conſideration will have the force of a great ſwaſive. Conſidering therefore, from how few and deſpicable Principles the whole Body of Geometry, by continual conſequence, is inforced; if ſo fair a Pile, and curious Structure may be raiſed, and ſtand faſt upon ſo ſmall a Bottom; I could not think it incredible, that we might attain ſome conſiderable ſucceſs in this Deſign, how little ſoever we had at firſt to begin upon: and, from thoſe little Actions and Geſtures, which have a kind of Natural ſignificancy, we might, if well managed, proceed gradually to the Explication of a compleat Language, and withal, direct to thoſe curioſities of Motion and Poſture in the Organs of ſpeech, requiſite to the Formation of a Sound deſired; and, ſo to effect both parts of what we intend.

My next Inducement to undertake it, was a conſideration of the Perſon, (which, in a work of this nature, is of no ſmall concernment;) who was repreſented to me as very Ingenious and Apprehenſive, (and therefore a fit ſubject to make an Eſſay upon;) and ſo far at leaſt a Mathematician as to Draw Pictures; wherein, I was told, he had attained ſome good ability, which did induce me to believe that he was not uncapable of the Patience, which will be neceſſary to attend the Curioſity of thoſe little varieties in the Articulation of Sounds; being already accuſtomed to obſerve and imitate thoſe little Niceties in a Face, without which it is not poſſible to Draw a Picture well.

I ſhall add this alſo; That, once, he could have ſpoken, though ſo long ago, that (I think) he doth ſcarce remember it. But having, by accident, when about five years of age loſt his Hearing, he conſequently loſt his ſpeech alſo; not all at once, but by degrees, in about half a years time: which though it do confirm what I was ſaying but now, How needful it is for the Ear to guide the Tongue in Speaking, (ſince that Habit of Speaking, which was attained by Hearing, was alſo loſt with it,) and might therefore diſcourage the undertaking; yet I was thereby very much ſecured, that his want of Speech was but a conſequent of his want of Hearing, and did not proceed originally from an Indiſpoſition in the Organs of Speech to form thoſe Sounds. And though the neglect of it in his younger years, when the Organs of Speech, being yet tender, were more pliable, might now render them leſs capable of that Accurateneſs which thoſe of Children attain unto: (whereof we have daily experience; it being found very difficult, if not impoſſible, to teach a Forraigner well in years, the Accurate pronouncing of that Sound or Language, which in his tender years he had not learned:) yet, if he can attain to ſpeak but ſo well as a Forraigner, at his years, may learn to ſpeak Engliſh; what ſhall be farther wanting to that Accurateneſs which a

Native from his Childhood attains unto, may, to an indifferent eſtimate, be very well diſpenſed with.

Having thus acquainted you with thoſe Conſiderations which did induce me to attempt it; leaſt you may think I build too confidently thereupon, and judge me guilty of too much vanity, in promiſing my ſelf a greater ſucceſs than can, in reaſon, be hoped for; It will next be neceſſary to give you ſome account, what meaſure of Succeſs I might propoſe to my ſelf as probable, in ſuch an undertaking.

And as to the firſt part of it, (that of *Speaking*;) Though I did believe, that much more is to be effected than is commonly thought Feſible, and that it was poſſible for him ſo to ſpeak as to be underſtood; yet I cannot promiſe my ſelf, that he ſhall ſpeak ſo Accurately, but that a Critical ear may eaſily diſcern ſome Failures, or little differences from the ordinary tone or pronunciation of other men; (ſince that we ſee the like every day, when not Forraigners only, but thoſe of our own Nation in the remoter parts of it, can hardly ſpeak ſo Accurately, as not to diſcover a conſiderable difference from what is the common Dialect or Tone at *London*.) And this not onely upon the conſideration laſt mentioned; (concerning the Organs of Speech leſs pliable to thoſe Sounds to which they were not from the firſt accuſtomed;) but eſpecially upon that other conſideration, concerning the Ears uſefulneſs to guide and correct the Tongue. For as I doubt not, but that a Perſon, who knows well how to Write, may attain, by cuſtome, ſuch a Dexterity, as to write in the Dark tolerably well; yet it could not be expected, that he ſhould perform it with the like Elegancy, as if he ſaw the Motions of his hand: ſo neither is it reaſonably to be expected, that he who cannot Hear, though he may know how to ſpeak Truly, ſhould yet perform it ſo Accurately, as if he had the advantage of his Ear alſo.

Nor can I promiſe, nor indeed hope, that how Accurately ſoever he may learn to ſpeak, he ſhould be able to make ſo great Uſe of it as others do. For ſince that he cannot hear what others ſay to Him, as well as expreſs his own Thoughts to Them; he cannot make ſuch uſe of it in Diſcourſe as others may. And though it may be thought poſſible, that he may, in time, diſcern, by the motion of the Lips, viſible to the Eye, what is ſaid to him; (of which I am loth to deliver a poſitive judgment, ſince much may be ſaid conjecturally both ways;) yet this cannot be expected, till at leaſt he be ſo perfectly Maſter of the Language, as that, by a few Letters known, he may be able to Supply the reſt of the Word; and by a few Words, the reſt of the Sentence, or at leaſt the ſenſe of it, by a probable conjecture, (as when we Decipher Letters written in Cipher:) For, that the Eye can actually diſcern all the varieties of Motion in the Organs of Speech, and ſee what Sounds are made by thoſe Motions, (of which many are Inward, and are not expoſed to the Eye at all,) is not Imaginable.

But as to the other Branch of our Deſign, concerning the Underſtanding of a Language: I ſee no reaſon at all to doubt, but that he may attain This, as perfectly as thoſe that Hear; and that, allowing the like Time and Exerciſe, as to other men is requiſite to attain the Perfection of a Language, and the Elegance of it, he may Underſtand as well, and Write as Good Language as other men; and (abating onely what doth directly depend upon Sound, as Tones, Cadencies, and ſuch Punctilio's,) no whit inferiour to what he might Attain to, if he had his Hearing as others have. And what I ſpeak of him in particular, I mean as well of any other Ingenious perſon in his Condition; who, I believe, might be taught to uſe their Book and Pen as well as others, if a right Courſe were taken to that purpoſe.

To tell you next, What Courſe I have hitherto uſed towards this Deſign, it will not be ſo neceſſary. For ſhould I deſcend to Particulars, it would be too Tedious; eſpecially ſince they are to be uſed very differently, and varied as the preſent Caſe and Circumſtances do require. And, as to the General way, it is ſufficiently Intimated already.

As to that of Speech; I muſt firſt, by the moſt ſignificant ſigns I can, make him to underſtand, in what Poſture and Motion I would have him apply his Tongue, Lips, and other Organs of Speech, to the Forming of ſuch a Sound as I direct. Which if he hit right, I confirm him in it: If he miſs, I ſignifie to him, in what he differed from my Direction; and, to what Circumſtances he muſt attend to mend it. By which means, with ſome Trials, and a little Patience, he learns firſt one, then another Sound; and, by frequent Repetitions, is confirmed in it; or (if he chance to forget) Recovers it again.

And for this Work, I was ſo far prepared before hand, that I had heretofore, upon another occaſion, (in my Treatiſe *De Loquela*, prefixed to my *Grammar* for the *Engliſh Tongue*,) conſidered very exactly (what few Attend to) the Accurate Formation of all Sounds in Speaking, (at leaſt as to our own Language, and thoſe I knew:) without which, it were in vain to ſet upon this Taſk. For, if we do not know, or not conſider, how we Apply our own Organs in Forming thoſe Sounds we Speak, it is not likely, that we ſhall, this way, Teach another.

As to that of Teaching him the Language: I muſt (as Mathematicians do from a Few Principles firſt granted,) from that little ſtock (that we have to Begin upon) of ſuch Actions and Geſtures as have a kind of Natural ſignificancy, or ſome Few Signs, which himſelf had before taken up to expreſs his Thoughts as well as he could, Proceed to Teach him, what I mean by ſomewhat elſe; and ſo, by ſteps, to more and more: And this, ſo far as well I can, in ſuch Method, as that what he Knows already, may be a ſtep to what he is next to Learn; as, in Mathematicks, we make uſe, not of Principles only, but Propoſitions already demonſtrated, in the Demonſtration of that which follows.

It remains now, for the Perfecting the Account which at preſent you deſire of me, only to tell you, what Progreſs we have already made. Which, had not your Deſires commanded from me, I ſhould have reſpited a while longer, till I might have made it ſomewhat Fuller.

He hath been already with me ſomewhat more than Two Moneths. In which time, though I cannot be thought to have Finiſhed ſuch a Work; yet the Succeſs is not ſo little, as to Diſcourage the Undertaking: but as much as I could hope for in ſo ſhort a time; and more than I did Expect. So that I may ſay, the Greateſt difficulty of Both Parts being almoſt over; what Remains, is little more than the work of Time and Exerciſe. There is hardly any Word, which (with deliberation) he cannot Speak; but, to do it Accurately, and with Expedition we muſt allow him the Practice of ſome conſiderable Time, to make it familiar to him.

And, as to the Language; though it were very Indifferent to him who Knew none, which to begin withal; yet, ſince it is out of Queſtion, that *Engliſh*, to him, is like to be the moſt Uſeful and Neceſſary; it was not adviſeable to Begin with any other. For though he can Pronounce the Latine with much more Eaſe, (as being leſs perplexed with a multitude of concurring Conſonants;) yet this is a Conſideration of much leſs concernment than the other.

To this therefore having applyed himſelf, he hath already Learned a great many Words, and, I may ſay, a conſiderable part of the *Engliſh*, as to Words of moſt Frequent uſe: But the whole Language being ſo Copious, though otherwiſe Eaſy, will require a longer Time to Perfect what he hath Begun.

And this, Sir, is the full Hiſtory of our Progreſs hitherto. If you ſhall hereafter eſteem our Future Succeſs, worthy your taking notice of, You may Command that, or what elſe is within the power of

Oxford,
March 14. 166½.

SIR,

Your Honours very humble
Servant,

John Wallis.

THE Perſon, to whom the foregoing Letter doth refer, is Mr. *Daniel Whaley* (Son of Mr. . . . . . *Whaley*, late of *Northampton*, and Mayor of that Town.) He was (ſoon after the date of this Letter) on the 21 of *May*, 1662. preſent at a Meeting of the *R. Society* (of which the *Regiſter* of that days proceedings takes particular notice,) and did in their preſence, to their great ſatisfaction, pronounce diſtinctly enough ſuch words as by the Company were propoſed to him; and though not altogether with the uſual Tone or Accent, yet ſo as eaſily to be underſtood: Whereupon alſo the ſaid Doctor was, by the ſame Aſſembly, encouraged to purſue what he had ſo ingeniouſly and ſo ſucceſsfully begun. About the ſame time alſo (His Majeſty having heard of it, and being willing to ſee him) he did the like ſeveral times at *Whitehall*, in the preſence of His Majeſty, His Highneſs Prince *Rupert*, and divers others of the Nobility, though he had then employed but a ſmall time in acquiring this ability. In the ſpace of one year, which was the whole time of his ſtay with Dr. *Wallis*, he had read over a great part of the Engliſh Bible, and had attained ſo much ſkill as to expreſs himſelf intelligibly in ordinary affairs; to underſtand Letters written to him, and to write Anſwers to them, though not elegantly, yet ſo as to be underſtood: And in the preſence of many Forraigners (who out of Curioſity have come to ſee him,) hath oft-times, not only read *Engliſh* and *Latin* to them, but pronounced the moſt difficult words of their Languages (even *Poliſh* it ſelf,) which they could propoſe to him. Since that time, though he hath not had opportunity of making much further improvement for want of an Inſtructour, yet he doth yet retain what he had attained to; or, wherein he may have forgot the niceneſs requiſite in the pronunciation of ſome Sounds, doth eaſily recover it with a little help.

Nor is this the only Perſon on whom the ſaid Doctor hath ſhewed the effect of his ſkill, but he hath ſince done the like for another (a young Gentleman of a very good

Family, and a fair Eſtate,) who did from his birth want his Hearing. On this occaſion I thought it very ſuitable to give notice of a ſmall *Latin* Treatiſe, of this ſame Authour, firſt Publiſhed in the year 1653, intituled *De Loquela* [of *Speech*,] prefixed to his *Grammar of the Engliſh Tongue* (Written alſo in *Latin.*) In which Treatiſe of *Speech* (to which he refers in this diſcourſe, and on confidence of which he durſt undertake that difficult taſk) he doth very diſtinctly lay down the manner of forming all Sounds of Letters uſual in Speech, as well of the Engliſh, as of other Languages, which is, I think, the firſt Book ever Publiſhed in that kind, (for, though ſome Writers formerly have here and there occaſionally ſaid ſomething of the Formation of ſome particular Letters; yet none, that I know of, had before him undertaken to give an account of all.) Whether any, ſince him, have with more judgment and accurateneſs performed the ſame, I will not take upon me at all to determine. In his *Grammar of the Engliſh Tongue* (to which this *of Speech* is prefixed) he hath ſo briefly and clearly given an account of this Language, as may be very advantagious, not only to Strangers for the eaſy attainment thereof, but even to the Engliſh themſelves for the clear diſcovering (which few take notice of) the true *genius* of their own Language.

A Relation,

Concerning the Sal-Gemme-Mines *in* Poland; *communicated by a Curious Gentleman of* Germany, *who, ſome years ſince, deſcended himſelf into thoſe Mines, to the depth of* 200 *Fathoms, and was led about in them for the ſpace of three hours.*

THE Mines of *Sal-Gemme* in *Poland*, a mile diſtant from *Cracovia*, near the ſmall Town of *Wilizka*, which (the *Church* excepted) is altogether digged hollow under ground, hath Eight deſcents, of which the two chief, being in the Town it ſelf, are thoſe through which the Salt is drawn up; the other two do ſerve for letting down Timber and other neceſſaries. Theſe deſcents, or holes, are five ſquare, four or five foot long, and as broad, lined downwards thorough with Timber. Above, is a great Wheel, with a ſtrong rope, of the thickneſs of a luſty arm, drawn about by a Horſe, like in a Horſ-mill.

He that will deſcend, muſt cover himſelf with a Frock, and have another man, that faſtens another rope to the aforeſaid big rope, and having ſo tyed it about himſelf as to ſit in it, takes one in his lap and holds him faſt about; whereupon the big rope being let ſomewhat down, another faſtens likewiſe a piece of rope to the other thick rope, and does like the former, ſeating himſelf in it, and taking and claſping another man in his lap, and being alſo let down a little way gives place to others to do the like; in which manner, thirty, fourty and more perſons may be let down all at once; of whom the firſt having touch't the ground, ſteps out and goes aſide, the reſt following him and doing the like. And thus they deſcend to the depth of 100 Fathoms. But then they take a Lamp, and lead people about by ſtrange paſſages and Meanders, ſtill more and more deſcending, till they come to certain Ladders, by which they go down an 100 Fathoms deeper, where there are double paſſages and holes one above another, in abundance; for the Mine-men dig on ſtill, and cut out every where and on all ſides, as long as the Salt-vein laſteth, and Salt is found; but the Vein being loſt, and no more Salt appearing in one place, they ſearch for other Salt-veins; whence come ſo many holes and paſſages out of one into another. The great holes, to ſecure both the Town above, and the work below from falling in, are very carefully filled out and ſupported by ſtrong and well-compacted Timber; of which there is enough in thoſe Works to build a big Town with.

Out of theſe Mines they dig and cut out three ſorts of Salt; one is common, courſe and black; the ſecond ſomewhat

what finer and whiter; the third, very white, and clear like Chryſtal. The courſe and black Salt is cut out in great pieces, roundiſh, and three Polonian Ells long, and one Ell thick, which coſts fifty to ſeventy Polonian Florins. Mean time the inhabitants of *Cracow* have a priviledge, whereby a certain number of pieces is to be deliver'd to them, eight ſuch Florins the piece. The great pieces lye at *Cracow* about the Streets, before the doors of the Citizens; as alſo in the Country, in the ſmall Towns and Villages, and before the Forts and houſes of the Nobility; Where the Cattel, paſſing to and fro, lick of thoſe Salt-ſtones; which afterwards by Mills and other Engines are grownd and beaten ſmall for uſe.

The *Colour* of theſe Salt-ſtones is Darkiſh gray, with ſome mixture of Yellow. The Inſtruments, wherewith they are digg'd and cut out, have almoſt all *German* names with *Polonian* terminations; for, when this Salt-work was firſt found, (which is now above four hundred years ago) the Mine-men, that firſt began to work in it, were *Germans*; whence the *Poles* have retain'd thoſe names of the Tools, but given them *Poliſh* terminations.

Theſe Salt-works belong to the King of *Poland*, who appoints and maintains the Officers of them; and 'tis one of his beſt Royal Revenues, amounting to conſiderable ſums of moneys. There is no leſs than a thouſand men, that are conſtantly employed in theſe Mines; and there was then a proviſion of Salt, valued at two Millions.

There are in theſe Works three Horſes, that ſtay always below having their Stable and other neceſſaries there: they carry the Salt from the places, where 'tis cut and digg'd out, to thoſe; whence 'tis by the abovemention'd Wheel and Ropes drawn up, by a Horſe above ground, going round about. The Horſes, after they have been a while under-ground, grow blind from the ſharpneſs of the Salt; and all the three, which then laboured there, were quite blind; and one of them, that had been longeſt in thoſe Mines, had the hoofs of his feet grown as long again as they are uſually, ſo that each hoof was near a ſpan long.

This Salt-work hath alſo beneath it certain Salt-ſprings, whence the Saltwater is by Channels conveyed to ſeveral places, where 'tis boyled to Salt.

But there is yet another Mineral Salt-work in *Poland*, *viz.* at *Bochna*; but not ſo well order'd, as the former. Beſides there are divers other places in *Poland*, and in *Ruſſia* alſo, which yield Salt; as at *Holitz*, *Colomeja*, *Solum*, *Piniz*, *Oſwentz*, *&c.* In the *Podolian* deſert, near the River *Boriſthenes*, is a Salt-lake, whoſe water is by the heat of the Sun waſted, and turn'd to Salt, ſo that the people there ride into it with Horſes and Waggons, like unto Ice, and cut it into pieces, and carry it away; as the Poliſh Hiſtorian *Cromerus* at large relateth; who alſo affirms, that in the aforeſaid *Salt-work* at *Bochna* they find a Frozen ſubſtance, which by them is called *Carbuncle*, uſed by the people to purge their Bodies, by grating and drinking it in a convenient vehicle.

The Way of making Vinegar in France, *Communicated to the* Publiſher, *by an Ingenious Phyſitian of that Nation, living at a place, where much of it is made.*

THey take two great Caſks, within each of which they put at the bottom a Trevet, which muſt be one foot high, and as large, as the largneſs of the Caſk permits. Upon this Trevet they put Vine twiggs, whereon they lay a ſubſtance call'd *Rape*, with which they fill both Veſſels within half a foot from the top. This Rape is nothing elſe, but the wood or ſtalks of the Cluſters of Grapes, dryed and freed from the Grapes. The Trevet and the Vine-branches are put at the bottom of the Caſks, only to keep the Rape from ſetling at the bottom. It is this Rape, which alone heats and ſowrs the Wine. The two

Veſſels being almoſt quite filled with the Rape, one of them is filled up with Wine, and the other only half full for the time; and every day they draw, by a cock, half the Wine, that is in the full Veſſel, therewith quite to fill up the other, that is but half full; obſerving enterchangeable turns of filling and unfilling the Veſſels. Ordinarily, at the end of two or three dayes, the half-filled Veſſel begins to heat, and this heat augments for ſeveral dayes ſucceſſively, continuing to do ſo till the Vinegar is perfectly made; and the Workmen know, that the Vinegar is made by the ceaſing of the heat. In Summer it is a work of fifteen dayes; in Winter it proceeds more ſlowly, and that according to the degree of Cold weather.

When the weather is hotteſt, the wine muſt be drawn twice a day, to put it out of one Veſſel into the other. It is only the half filled Caſk that heats, and as ſoon as you have done filling up, its heat is choaked and ſtopped for the time, and the other Caſk, which is unfilled, begins to heat.

The full Veſſel is quite open at the top; but a wooden cover is put on the Veſſel, that is but half full.

The beſt Wine makes the beſt Vinegar; but yet they make good Vinegar of Wine that is turned.

The Wine, in changing, leaves a certain Greaſe, which ſticks *partly* to the ſides of the Caſk, (and *that* they take care to do clean away) *partly* to the Rape; ſo that if they cleanſe not the Rape from it almoſt every year once, the Wine turns into a whitiſh liquor, which is neither Wine nor Vinegar.

At the time when they pour the Wine out of one Veſſel into the other, a ſcum ariſeth on the top of the Veſſel, which muſt be carefully taken away.

In the Caſks, which have never ſerved for this purpoſe before, the Vinegar is made more ſlowly, than in ſuch, that have been uſed already.

So far the firſt communication concerning this matter : In which occurring ſeveral particulars, requiring further Information, and they being ſent to the Author, he was pleaſed to return what follows.

TIs ſo far, that the Rape is put into any place to ſowr before it be caſt into the Vinegar-veſſels, that as ſoon as 'tis ſeparated from its Grapes (which is done immediately after Vintage,) it is carefully put up in Barrels, leaſt it take Air; without which it would heat it ſelf, and be ſpoyled.

There is no other way of keeping the Rape that hath once ſerved already, than to drown it; that is to ſay, to fill the Veſſel, wherein it is, with Wine or Vinegar. Rape will ſerve a year, more or leſs, provided that care be taken of cleaning every morning, with a piece of Linnen, the greaſe that is on the ſides of the Veſſel, and with a little broom, that which ſwims on the top of the liquor. The Rape may be freed from its greaſe with water, rubbing it between ones hands.

No body, that I know, hath hitherto examin'd what this Greaſe is. When I can get a fit quantity of it, I will endeavour to make ſome Experiments about it; eſpecially if I be aſſiſted with Suggeſtions for making proper ones.

I have been lately inform'd, that there have been Merchants here, who made Vinegar with phlegme of Wine, remaining after that the *Aqua vitæ* is extracted from it,

An Account of ſome Books.

I. *MECHANICA, ſive De MOTU Tractatus Geometricus*; *PARS SECUNDA*; *in qua, De CENTRO GRAVITATIS Ejuſque CALCULO: Auth.* Johanne Wallis, *SS. Th. D. Geometriæ Profeſſ. Saviliano in Celeberr. Acad. Oxonienſi*; *Regalis Societ. Sodali, & Regiæ Majeſtati à Sacris. Londini*, *Impenſis* Moſis Pitt *in Vico vocato* Little Britain, 1670. in 4°.

IN this *Second* Part (amongſt many other things, in this and the foregoing Part, *Demonſtrated*, which are wont to be *Poſtulated*, but ſhould be Proved;) the Excellent Author *demonſtrates* the Center of Gravity *to be*(which hath not been done formerly, that we know of, by any;) and that, as to all *Ponderation*, the *whole weight* may juſtly be reputed There to *be*, where is its *Center of Gravity*; and ſo much to be mov'd: with other general *Affections* thereof. He ſhews alſo, from General Principles, How, by Calculation, to determine, as well the *Magnitude*, as the *Center of Gravity*, in innumerable ſorts of *Lines*, *Surfaces*, and *Solids*, (and the *Aggregates* or *Differences* of ſuch.) As, in all *Right-lined Figures* whatſoever; in all *Solids bounded by Plains*; in *Cones* alſo and *Cylinders*: And in *Curve-lined Figures* innumerable; not only (with *Archimedes*) in the *Parabolar* Figure, but likewiſe in all *Paraboloeids* whatever (and the *parts* of ſuch;) together with their *Ungular* Solids inſiſting on them; and their *Conoeids* or other Solids made by the *Converſion* (perfect, or imperfect,) of thoſe Plains (or their Parts) about any *Axe* in the ſame Plain aſſigned; and the *Center of Gravity* of all theſe *Solids*. And the like alſo in other Figures *Reciprocal* to theſe Paraboloeids, infinitely continued between ſuch Curves and their Aſymptotes: Shewing, which of thoſe Figures (*infinitely Long*) are of *Finit* magnitude, (and what that is;) which, of *Infinit*: and, which of them have, which have not, *Centers of Gravity*; and, in thoſe which have, how to Aſſign them: And the like of the *Unguls* appertaining to them,

them, and the *Solids* made by their *Converſion* about an *Axe:* In many of which, the Magnitude of the *Vngle* or *Solid* is ſhew'd to be but *Finit*, where the Magnitude of the reſpective *Plain* (on which they ſtand, or by whoſe converſion they be made) is *Infinit:* and (contrary-wiſe) in Others, the Magnitude of the *Vngle* or *Solid* to be *Infinit*, where that of the *Plain* is but *Finit*.

He gives alſo General *Methods*, How, from the *Center of Gravity* of a *Plain* (or of *Lines* deſcribed in a Plain) whoſe Magnitude is alſo known; to find the Magnitude of the *Vngles*, and *Solids* made by Converſion thereof about aſſigned Axes; and, from *Theſe*, to find *That:* with other like Proceſſes, from *Plains* to *Solids*, and ſo onward. He ſhews not only (with *Archimedes*) the *Solidity* and *Surface* of the *Sphere* and *Cylinder*; but of their *Segments* and *Portions*, cut off by a Plain, or any number of Plains, in what manner ſoever; and the *Center of Gravity* of the ſame: moſt of which (as to the Solidity and Center of Gravity) is in like manner applicable to the *Spheroid*; uſeful in *Guaging* Veſſels, and otherwiſe. He ſhews particularly, that the *Scalene Cylindrick Surface*, is to the *Erect*, as the *Perimeter of an Ellipſe* to that of a Circle.

He ſhews the Center of Gravity of all *Arches* of Circles, with their *Superficial Vnguls*, and the *Surfaces* made by the *Converſion* of ſuch Arches about aſſigned *Axes*. And the like, of the *Sectors*, *Segments*, and other *Portions of Circles*, (which are applicable alſo to thoſe of *Ellipſes;*) with the *Vnguls*, and *Solids* made by ſuch *Converſion*; and their *Centers of Gravity*. He doth the like in the *Cycloid*, ſhewing the length of the *Curve*, and of the *Portions* thereof, with their *Centers of Gravity*, and their ſeveral *Superficial Vnguls*, and *Surfaces*, made by *Converſion*, and the *Centers of Gravity* of all theſe. As likewiſe the Magnitude of the *Plain*, as well of the *Primary Cycloid*, as of the *Secundary*, whether *Contracted* or *Protracted*; with their ſeveral *Tangents:* and of the *Segments* and *Portions* of thoſe Plains; with their ſeveral *Vnguls*, and *Solids* made by their Converſion (Perfect, or Imperfect,) and the *Centers of Gravity* of all theſe: Wherein in he proſecutes at large, what was deliver'd in his Book *De Cycloide*, formerly publiſh't; continuing his *Calculations* (which were there begun) to a great number of Particular Caſes, which (for reaſons then aſſigned) were there omitted, and which have not by any hitherto been computed.

He doth the like, in the *Figure of Right-Sines*, in the Figure of *Verſed Sines*, and of *Arches*; aſſigning the *Magnitude* of thoſe *Figures*, and of their *Segments* and *Portions*; with their *Unguls*, and *Solids* by *Converſion*; and the *Centers of Gravity* of all theſe. Whence (amongſt many other things) are deduced the *ſums* of the *Right-Sines*, *Verſed Sines*, and *Arches*, appertaining to any aſſigned Portion of a Circle; and the *Sums* of their *Squares*, *Cubes*, or other *Powers*:

He doth the like in *Spiral* Figures, as well that of *Archimedes*, as an infinit number of *other Spirals*; ſhewing the *Magnitude* of the ſeveral *Parts* or *Sectors*; with their *Centers of Gravity*; (all applicable alſo to their reſpective *Scalar Solids*:) and the reſpective *Paraboloeids* with which they Symbolize, and by whoſe *Convolution* they are made; their *Tangents* alſo, with much more concerning them. He proſecutes the ſame in part, but more briefly, in the *Ciſſoeid*, and *Conchoeid*, and the *Figure of Tangents*; as to the *Magnitude* of thoſe Figures, and the Parts thereof; their *Unguls*, *Solids*, and *Centers of Gravity*. He ſhews particularly as to the *Ciſſoeid*, how it doth ſymbolize with the *Cycloeid*, the parts of the one figure being equal to the reſpective parts of the other: And, as to the *Conchoeid*, That its Plain is in Magnitude (as well as Longitude) Infinite; yet a Solid made by its Converſion, equal to a finit Cylinder.

He ſhews alſo the *Quadrature* of the *Hyperbola*, and *parts* thereof; their *Unguls*, *Solids*, and *Centers of Gravity*: As alſo, an *Hyperbolical Solid, made by the Converſion of a Streight Line about an Axis not in the ſame Plain*; ſhewing the *Magnitude* of that *Solid*, and of its *Parts*, and their *Centers of Gravity*; and the ſeveral *Sections* of that *Solid made* by *Plains* in any aſſigned poſition; being *Parabola's*, *Hyperbola's*, *Ellipſes*, *Circles*, *Parallelograms*, and *Triangles*: according to the different Poſitions of the Cutting Plains: With many other particulars, too many to be here rehearſed.

In ſhort, you have here well nigh All or the Greateſt part of the moſt abſtruſe and intricate Speculations, as well of the Antient as the Moderns Geometers, hitherto diſcover'd, (with many new Additionals;) briefly and clearly deduced from Peculiar Principles and Methods of his own; (eſpecially thoſe of his *Arithmetica Infinitorum*;) which are alſo in like manner applicable to Innumerable other Caſes, as occaſion ſhall require. And his Method (in this and the former part) deducing all from the firſt principles, doth ſcarce depend upon any other Treatiſes as neceſſary to the underſtanding; ſave only the knowledge of ſome very ordinary things in common Geometry, and ſome few Propoſitions out of his own *Arithmetick of Infinits*, with ſome ſkill in the practice of *Numerous* and *Specious* Arithmetick.

II. *EXERCITATIONES MECHANICÆ*, Alexandri Marchetti. *Piſis*, 1669. *in* 4°. *To be found at Mr.* Starky's *near* Temple Bar.

THis Author declareth, that though many Eminent men have already treated of the Subject of this his Book, as *Ariſtotle*, *Archimedes*, *Lucas Valerius*, *Guldinus*, *Galileus* and others; yet hath he not been deterred from writing of the ſame Argument, eſteeming, that he hath handled it more largly, more diſtinctly, and more clearly and eaſily: which, how he does actually perform, we leave to Mathematical Mechanicians to Judge.

III. *The Natural Hiſtory of* NITER, *or, a Philoſophical Diſcourſe of the Nature, Generation, Place, and Artificial Extraction of* NITER, *with its Vertues and Uſes, by* WILLIAM CLARKE. *London*, 1670. *in* 8°.

The Author of this Tract, eſteeming, that moſt, who have known this Mineral Body, ſeem to have had but a *partial* knowledge of it, undertaketh to deliver here its *Compleat* Hiſtory; And therefore

Firſt, deſcribeth *Niter* by its properties, *Figure* (like that of Needles,) *Taſte* (ſalt, ſharp and cooling,) and *Inflammability*,

mability, having this peculiar, that it burns *downwards.*

Secondly, giveth ſome Chymical Analyſis of *Niter*, both by *calcination*, in which he ſaith that it burns almoſt all away if refined; and by *Deſtillation in a Retort*, which maketh it yield a little Flegme, then a Spirit, firſt in the form of a white, and ſoon after in that of a red vapour, corroſive and fetid, leaving a *Caput mortuum* behind. Where the Author giveth us his opinion, that this Body being thus analyſed is rendered incapable of Redintegration; (concerning which the Reader may conſult that Noble and Experienced Philoſopher Mr. *Boyle*, in his *Eſſay* containing an Experiment with ſome Conſiderations touching the differing parts and Redintegration of *Salt-petre*; Printed 1661.)

Thirdly, examines the Queſtion, whether *this* Niter is the ſame with the Niter of the *Antients*; and reſolveth it in the *Affirmative.*

Fourthly, enquireth into the Generation and Place of Niter; Where he diſcuſſeth that *Inquiry*, whether in Houſes, or Walls, Earthen-floars, &c. *Niter* be *generated*, or *ſeparated* and drawn from the Air by the heat and dryneſs of the Places; obſerving, that the dryer the places, where Niter is, are kept, there is more *Niter*. Whereupon he diſcourſeth largely of the Niter in the *Air*, and making it not only a *Meteor* it ſelf, and particularly a cauſe of lightning and thunder, but a *general* cauſe of Meteors, joyntly with *Sulphur*.

Fifthly, he declareth the *Uſe* of Niter to *Animals* and *Vegetables*; affirming *firſt*, that the life of Animals, being a burning *Sulphur*, is, as't were, kindled by the *Nitrous* Air received into the Lungs and communicated to the Heart; and adding that as without Air, which is the life of Fire, the innate animal-heat would extinguiſh; ſo that Air, being *Nitrous*, not only inflames it, but from its Coolneſs ſo allays the ſame, that it doth not too much prey upon our Radical moiſture, and keeps our life in its due Fermentation; and moreover, by its diſſolving nature renders the humors of the Body more fluid, and ſo more apt to perform their Circular motions, for the entertaining of life. *Secondly*, that without this *Nitroſity* the Sulphur of Seeds would lye dormant in [illegible] ſcorched up and wither'd, nor paſs into the pores of Plants.

Sixthly, he delivers the Artificial manner of Extracting and Refining of Niter; after he had firſt inform'd his Reader. How it may be known, whether a place be impregnated with Niter or no?

Seventhly, he giveth the *Vertues* and *Uſes* of Niter; *firſt* in *Phyſick*; where he affirms it to be not only *Cooling*, at leaſt by removing hot humors, whereby the Body may become cooler; but alſo *Reſo'ving*, *Purgative* and *Diuretical*: Upon the ſcore of all which properties 'tis uſed not only in *Burning Feavers*, in the form of the *Lapis prunellæ*, (the preparation of which he deſcribeth;) but alſo in thoſe Diſeaſes, in which are to be diſcharged by ſiege and Urine, hot, ſharp, cholerick and obſtructive humors. Having diſpatched this Medicinal uſe, he proceeds *next* to the uſe of Niter in *Chymiſtry*; where he obſerveth that by it may be made a pleaſant and cooling Acid; or a hot and burning Corroſive: that ſometimes it revives the Vomitive and Purgative vertue of *Antimony*, ſometimes it kills the Vomitive, and reviveth only the Purgative, and ſometimes it deſtroyes both, and quickens neither the Diuretick or Diaphoretick, &c. beſides that it Calcineth, Sublimeth and Diſſolveth *Minerals* and *Metals*. *Thirdly*, he adds the Uſe of Niter in *Artillery*; where he diſcourſes of the reaſon of the Compoſition and Force of *Gun-powder*, together with the Uſe and Office of every Ingredient of the ſame. *Fourthly* and laſtly, he ſets down the Uſes of Niter for *Refiners*, *Dyers* and *Cooks*.

ADVERTISEMENT.

THe Author of the Diſcourſe concerning *Mineral waters*, in Numb. 60. beginning *p.* 1074, deſireth, that theſe lines may be inſerted *p.* 1081. after the word *Dyſenteries*, *l.* 19. *viz.* Neither do I think this water any thing the worſe becauſe of the *Alome*, but much the better for it in Hypochondriack maladies: For by its adſtringency it defends the Tone of the Liver and the other natural parts, which otherwiſe are apt to be debilitated by purging and penetrating medicines; it being, according to *Galen's* advice, ever neceſſary to intermix ſome Adſtringents with Hepatick remedies; in Art. Med. c. 95. to which agree very good writers, antient and modern.

Errat. p. 1096. l. 2. r. *if he hit.*

LONDON,
Printed by T.R. for *John Martyn*, Printer to the *Royal-Society*. 1670.

Numb. 62

PHILOSOPHICAL TRANSACTIONS.

Auguſt 8. 1670.

The CONTENTS.

New Pneumatical Experiments about Reſpiration, *made and communicated by the Honourable* Robert Boyle, *in ſeveral Heads*; viz. *Obſervations made about the laſting of* Ducks, *included in the Exhauſted Receiver: Of the Phænomena afforded by* Vipers, Froggs, *and* Kitlings *in ſuch a Receiver: Some Tryals about the Air uſually harbour'd in the* Pores *of water: Of ſome Phænomena afforded by* Shell-Fiſhes, *and* Scale-Fiſhes *in the Pneumatical Engin: Of two Animals, included, with large wounds in the Abdomen; as alſo of the Motion of the ſeparated Heart of a Cold Animal, in the ſame Engin: A Compariſon of the Time, wherein Animals may be kill'd by Drowning, or by withdrawing of the Air.* The reſt reſerved for the next Month. *An Accompt of three Books*; I. *De* ANGLORUM GENTIS ORIGINE, *Auth.* Roberto Sheringham, *Cantabrigienſi.* II. *A Vindication of HYDROLOGIA CHYMICA, by* William Sympſon, *M.D.* III. *A Diſcourſe in Vindication of* DES-CARTES'*s Syſteme by M.* Des-Fourneillis; *together with the Syſtem General of the ſame CARTESIAN Philoſophy, by* Francis Bayle, *M. D. now both Engliſh'd out of French.*

NEW PNEUMATICAL EXPERIMENTS about RESPIRATION.

Theſe Experiments, made by that Indefatigable Benefactour to Philoſophy, the Honourable Robert Boyle. *in order to bring ſome more Light to the Doctrine of RESPIRATION, as well as to miniſter occaſion to Inquiſitive Naturaliſts to make farther Reſearches into the ſame, were by their Noble Author communicated to the Publiſher of theſe Papers; who eſteem'd it more convenient to make them a part of theſe Tracts (they taking up the room but of a few ſheets) than to publiſh them any other way.*

The I. Title.

Obſervations made about the laſting of Ducks *included in the Exhauſted Receiver.*

NAture having, as *Zoologiſts* teach us, furniſhed *Ducks* and other water-Fowl with a peculiar ſtructure of ſome veſſels about the heart, to enable them, when they have occaſion to

Dive, to forbear for a pretty while reſpiring under water without prejudice; I thought it worth the tryal, whether ſuch Birds would much better than other Animals endure the abſence of the Air in our exhauſted Receiver. The Accounts of which tryals were, when they were made, regiſtred as follows.

Experiment the 1.

We put a full-grown *Duck* (being not then able to procure a fitter) into a Receiver, whereof ſhe fill'd, by our gueſs, a third part or ſomewhat more, but was not able to ſtand in any eaſy poſture in it; then pumping out the Air, though ſhe ſeemed at firſt (which yet I am not too confident of, upon a ſingle tryal,) to continue well ſomewhat longer than a Hen in her condition would have done; yet within the ſhort ſpace of one minute ſhe appeared much diſcompoſed, and between that and the ſecond minute, her ſtrugling and convulſive motions increaſed ſo much, that, her head alſo hanging careleſly down, ſhe ſeemed to be juſt at the point of death; from which we preſently reſcued her by letting in the Air upon her: So that, this Duck being reduced in our Receiver to a gaſping condition within leſs than two minutes, it did not appear, that, notwithſtanding the peculiar contrivance of nature to enable theſe water-Birds to continue without reſpiration for ſome time under water, this Duck was able to hold out conſiderably longer than a Hen, or other Bird not-Aquatick, might have done: and to manifeſt, that it was not cloſeneſs and narrowneſs of the veſſel, in reference to ſo bulky an Animal, that produced in the ſubject of our tryal the great and ſuddain change above-recited, we ſoon after included the ſame Bird in the ſame Receiver, and having by a ſpecial way cemented it on very cloſe, we ſuffered her to ſtay thus ſhut up with the Air for five times as long as formerly (by our gueſſe, helped by a watch,) without perceiving her to be diſcompoſed; and ſhe would probably have continued longer in the ſame condition, if my patience and leiſure would have held out ſo long, as ſhe could have done in that priſon.

Experiment the 2.

Having at the ſeaſon of the year procured a *Duckling*, that was yet Callow, we conveyed her into the ſame Receiver wherein the former had been included, and obſerved, that, though for a while ſhe appeared not much diſquieted, whilſt the Air was pumping out of the glaſs, yet before the firſt minute was quite ended, ſhe gave manifeſt tokens of being much diſordered; and the operation being continued a while longer, ſhe grew ſo much worſe, that ſeveral convulſive motions, ſhe fell into before a ſecond minute was expired, obliged us to let in the Air upon her, whereby ſhe quickly recovered.

NB. I determine not, whether it be proper in this place to add, that when the Receiver was pretty well exhauſted, the included Bird appeared to the Spectators manifeſtly bigger, than before the Air was withdrawn, eſpecially about the crop, though that was very turgid before. And to manifeſt, that in this Duck, as in the former, the convulſions, that uſed to be immediately followed by Death, proceeded from the *withdrawing* of the ambient Air, and not from the *clogging* of it; we kept the ſame Duckling in the ſame Receiver very cloſe, to keep out all external Air, and to keep in the excrementitious ſteams of her body for above 6 min. without perceiving her to grow ſick upon her impriſonment; which yet laſted above thrice the time, that ſufficed to reduce her in the abſence of the Air to a gaſping condition.

NB. It not being intended, that Ducks and other water-Fowl ſhould any more than other Birds live in an exceeding rarified Air, but only be able to continue upon occaſion a pretty while under water, it may ſuffice, that the contrivance of thoſe parts, which relate to Reſpiration, be ſo far fitted for the purpoſe, as we ſhall ſee it is when we come to the *Tenth* Title.

The II. Title.

Of the Phænomena afforded by Vipers *included in an Exhauſted Receiver.*

COnſidering that Vipers are Animals endowed with Lungs (though of a differing ſtructure from thoſe of Men, Dogs, Cats, Birds, &c.) and that their bloud is, as to ſenſe, actually cold; I thought, it might upon both thoſe accounts be very well worth trying, what effect the withdrawing and abſence of the Air would have upon Animals ſo conſtituted. I therefore made divers tryals, ſome of which did not diſpleaſe me; but I know not by what misfortune the memorials of them were loſt, except two or three (which were not perfect,) that I ſhall here ſubjoine.

Experiment the 1.

We included a Viper in a ſmall Receiver, and as we drew out the Air, ſhe began to ſwell, and afforded us theſe Phænomena. *Jan.* 2. 1662/3

1. It was a good while after we had left pumping, ere the Viper began to ſwell ſo much as to be forced to gape, which afterwards ſhe did.

2. That ſhe continued, by our eſtimate, above 2½ hours in the exhauſted Receiver without giving clear proof of her being killed.

3. That after ſhe was once ſo ſwelled, as to be compelled to open her jaws, ſhe appeared ſlender and lank again, and yet very ſoon after appeared ſwelled again, and had her jaws disjoined as before.

Experiment the 2.

We took a Viper, and including her in the greateſt ſort of ſmall Receivers, we emptied the glaſs very carefully, and the Viper moved up and down within, as if it were to ſeek for Air, and after a while foamed a little at the mouth, and left of that foam ſticking to the inſide of the glaſſe: Her body ſwelled not conſiderably, and her neck leſſe, till a pretty while after we had left pumping; but afterwards the body and neck grew prodigiouſly tumid, and a bliſter appeared upon the back. An hour and an half after the Exhauſtion of the Receiver (which we then by tryal found to be pretty ſtaunch) the diſtended Viper did give by motion manifeſt ſigns of life; but we obſerved none afterwards. The Tumor reached to the neck, but did not ſeem much to ſwell the under-chap. Both the neck and a great part of the throat, being held betwixt the eye and the candle, were tranſparent enough, where the ſcales did not darken them. The jaws remained mightily opened, and ſomewhat diſtorted; the *Epiglottis* with the *rimula Laryngis* (which remained gaping) was protruded almoſt to the further end of the nether-chap. As it were from beneath this *Epiglottis* came the black tongue, and reached beyond it, but ſeemed by its poſture not to have any life, and the mouth alſo was grown blackiſh within: but the Air being readmitted after 23 hours in all, the Viper's mouth was preſently cloſed, though ſoon after it was opened again, aud continued long ſo; and ſcorching or pinching the tail made a motion in the whole body, that argued ſome life.

Experiment the 3.

April 26. To theſe Experiments upon Vipers, I ſhall add one, made upon an ordinary harmleſs *Snake*.

We included ſuch an Animal, together with a *Gage*, in a pretty portable Receiver, which, being exhauſted and well ſecured againſt

gainſt the ingreſs of the Air, was laid aſide in a quiet place, where it continued from 10 or 11 a clock in the forenoon, till about 9 the next morning; and then my occaſions calling me abroad, I looked upon the Snake, which, though he ſeemed to be dead, and gave no ſigns of life upon the ſhaking of the Receiver, yet upon holding the glaſs a convenient diſtance from a moderate fire, he did in a ſhort time manifeſt himſelf to be alive by ſeveral tokens, and even by putting forth his forked tongue. In that condition I left him, and, by reaſon of ſeveral avocations, came not to look upon him again till the next day early in the after-noon; at which time he was grown paſt recovery, and his jaws, which were formerly ſhut, gaped exceeding wide, as if they had been ſtretched open by ſome external violence.

The III. Title.

Of the Phænomena afforded by Frogs *in an Exhauſted Receiver.*

THe ſame conſiderations that induced me to make tryals upon Vipers, did alſo invite me to make ſeveral upon *Frogs*; the ſucceſs of ſome of which, the following Notes will declare. *Sept. 9. 1662.*

Experiment the 1.

We took a large luſty *Frog*, and having included her in a ſmall Receiver, we drew out the Air, and left her not very much ſwelled, and able to move her throat from time to time, though not ſo faſt as when ſhe freely breathed before the Exuction of the Air. She continued alive about two hours, that we took notice of, ſometimes removing from the one ſide of the Receiver to the other; but ſhe ſwelled more than before, and did not appear by any motion of her Throat or Thorax to exerciſe Reſpiration, but her head was not very much ſwelled, nor her mouth forced open. After ſhe had remained there ſomewhat above three hours (for it was not 3½ hours) perceiving no ſign of life in her, we let in the Air upon her, with which the formerly tumid body ſhrunk very much, but ſeemed not to have any other change wrought in it; and though we took her out of the Receiver, yet in the free Air itſelf, ſhe continued to appear ſtark dead. Nevertheleſs to ſee the utmoſt of the Experiment, having cauſed her to be laid upon the graſs in a Garden all night, the next morning we found her perfectly alive again.

Experiment the 2.

June 29.1660. About 11 of the Clock in the fore-noon, we put a *Frog* into a ſmall Receiver, containing about $15\frac{1}{4}$ *ounc.* Troy weight of water, out of which we had tolerably well drawn the Air, (ſo that when we turned the cock under water, it ſucked in about $13\frac{1}{4}$ *ounc.* of water:) The Frog continued in it (the Receiver all the while under water) lively enough till about 5 of the clock in the afternoon, when it expired. The Frog at the firſt ſeemed not to be much altered by the exuction of the Air, but continued breathing both with her throat and lungs.

Experiment the 3.

Sept 6.1662. We included into a pretty large Receiver a couple of Frogs newly taken, the one not above an inch long, and proportionally ſlender; the other, very large and luſty. Whilſt the Air was drawing out, the leſſer Frog ſkipped up and down very lively, and, ſomewhat to our wonder, clambered up ſeveral times to the ſides of the Receiver, inſomuch that he ſometimes *reſted himſelf againſt the ſide of the glaſs. When his body ſeemed to be perpendicular to the Horizon, if not in a reclining poſture, he continued to ſkip up and down a while after the exuction of the Air, but within a quarter of an hour (meaſured by a minute-watch) we perceived him to lye ſtark dead with his belly upwards. The other Frog, that was very large and ſtrong, though he began to ſwell much upon the withdrawing of the Air, and ſeemed to be diſtreſſed, by his frequently leaping up after the Air was drawn out, which he did not before, yet being as we ſaid very luſty, he held out half an hour, at which time it was remarkable, that the Receiver, though it had held out againſt the preſſure of the outward Air, during that ſpace of time, notwithſtanding that a piece of it had been cracked out, and was mended with a cloth deep'd in Cement, yet at the end of the half hour, the weight of the outward Air ſuddenly beat it in, and thereby brought the impriſoned Frog a reprieve, which hindered us from bringing the Experiment to an iſſue.

*

Experiment the 4th.

Sept. 11. We took a ſmall Frog, and having conveyed her into a very ſmall portable Receiver, we began to pump out the Air. At firſt ſhe was lively enough, but when the Air began to be conſiderably withdrawn, ſhe appeared to be very much diſquieted (leaping ſometimes after an odd manner, as it were to get out of the uneaſy priſon,) but yet not ſo, but that; after the operation was ended and the Receiver taken off, the Frog was perfectly alive, and continued to appear ſo (if I am not miſtaken) near an hour, though the Abdomen was *very much*, and the throat *ſomewhat* extended; this latter part having alſo left that wonted panting motion, that is ſuppoſed to argue and accompany the reſpiration of Frogs. At the end of about 3¼ hours, after the removal of the Receiver from the pump, the Air was let in; whereupon the Abdomen, which by that time was ſtrangly ſwelled, did not only ſubſide, but ſeemed to have a great cavity in it, as the throat alſo proportionably had; which cavityes continued, the Frog being gone paſt all recovery.

Experiment the 5th.

April 14. A large Frog was conveyed into a plated Receiver, and the Air being withdrawn, her body by degrees was diſtended; as appeared very notably, when by a caſual ſpringing of a leak, the Air got in again, and made her look much more lank and hollow than ever. The Receiver with the *Gage* were kept under water near ſeven hours, becauſe I was obliged to ſtay long abroad; at the end of which coming home I found the Receiver ſtaunch, but the Frog dead and exceedingly ſwelled: upon the letting in of the Air, ſhe became more hollow and lank than ever.

NB. I have purpoſely, both under this *Title* and ſome others, ſubjoyned ſome Tryals, whoſe events are not altogether ſuch, as others, recited under the ſame head, would invite one to expect; but I purpoſely do it, not only to be true to the Impartiality, I propoſed to my ſelf in writing theſe Narratives, but to awaken the curious to conſider and obſerve what variety of *Phænomena*, in ſuch tryals, may be attributed to the ſeaſon of the year, wherein they are made; and to the ſtrength, bulk, age, peculiar conſtitutions, *&c.* that relate to the reſpective Animal, on which the Experiments are made; beſides, what things may on other accounts be fit to be alſo conſidered.

The IV. Title.

Of the Phænomena afforded by a newly kitten'd Kitling *in the Exhauſted Receiver.*

BEing deſirous to try, whether Animals, that had lately been accuſtomed to live either without *any*, or without a *full* Reſpiration,

ſpiration, would not be more difficultly or ſlowly killed by the want of the Air, than others, which had been longer uſed to a free Reſpiration; We took a *Kitling* that had been kitten'd the day before, and put it into a very ſmall Receiver (that we gueſſed to hold about a pint or leſs) that it might be the ſooner exhauſted. As ſoon as the pump began to play, I took notice of the time, and found by a Watch, that marks Minutes and Quarter-Minutes, within one minute or a little more after the Air firſt began to be withdrawn, that the little Animal, who in the mean time had gaſped for life, and had ſome violent convulſions, lay as dead with his head downwards, and his tongue out; but upon letting in of the Air, he did in a trice ſhew ſigns of life, and being taken out of the Receiver quickly recovered: And to allow him the benefit of his good fortune, we ſent for a Kitling of the ſame age and litter, which being put into the ſame Receiver, quickly began, like the other, to have convulſions, after which he lay as dead; but obſerving very narrowly, I perceived ſome little motions, which made me conclude him alive; which I ſoon found I had cauſe to do. For though we continued pumping, and could not perceive that the Engine leaked more than in the former Experiments; the Kitling began to ſtir again, and after a while had ſtronger and more general convulſions than before; till at the end of full ſix minutes after the Exuction of the Air was begun, the Animal ſeeming quite dead, the outward Air was readmitted into the Receiver, which not reviving him as it had done the other, he was taken out of the veſſel, and lay with his mouth open, and his tongue lolling out without any ſenſible breathing, and pulſation; till having ordered him to be pinched, the pain or ſome internal motion, produced by the external violence done to him, made him immediately give manifeſt ſigns of life, though there was yet no ſenſible motion of the heart or the lungs; but afterwards gaping and fetching his breath in an odd manner, and with much ſtraining, as I have ſeen ſome *Fœtus's* do, when cut out of the womb, he little by little, within about a quarter of an hour, recovered: wherefore thinking it ſevere to make him undergo the ſame meaſure again, we ſent for another, kitten'd at the ſame time, and incloſing that alſo in the Receiver, obſerved, that divers violent convulſions, as it were gaſping for breath, into which he began to fall at the ſecond or third ſuck, ended in a ſeeming death, within about a minute and an half. But being made more diffident by the late Experiments, I cauſed the pump to be plyed, and the rather, becauſe I had a mind to obſerve, whether when the Air was from time to time drawn away, there would not, upon the opening of the ſtop-kock to let it out, appear ſome ſudden ſwelling, greater or leſs, of the body of the Animal, by the ſpring and expanſion of ſome Air (or Aërial matter) included in the Thorax, or the Abdomen. Such an inflation (though not great) we thought we obſerved; but till further tryal I dare not acquieſce in it. A while after, notwithſtanding our continuing to pump, the Kitling gave manifeſt ſigns of life, which was not till it had endured divers convulſions, as great as thoſe of the firſt fit, if not greater. When 7 min. from the beginning of the exhauſtion were compleated, we let in the Air; upon which the little creature, that ſeemed ſtark dead before, made us ſuſpect that he might recover; but though we took him out of the Receiver, and put *Aqua vitæ* into his mouth, yet he irrecoverably dyed in our hands.

Theſe tryals may deſerve to be proſecuted with further ones, to be made not only with ſuch Kittens, but with other very young Animals of different kinds; for by what has been related it appears, that thoſe Animals continued 3 times longer in the Exhauſted Receiver, than other Animals of that bigneſs would probably have done.

The V. Tittle.

Some tryals about the Air uſually harboured and concealed in the Pores *of Water*, &c.

IT might aſſiſt us to make the more rational conjectures about the Phænomena of divers of our Experiments, if we knew (ſomething near) what quantity of Aërial ſubſtance is uſually found in the liquors, we imploy about them, eſpecially in that moſt common of them, *Water*. And therefore, though it be very difficult, (if at all poſſible) to determine the proportion of the Air, that lurks in water, with any thing of certainty, many circumſtances making it ſubject to vary very much; yet to make the beſt eſtimate, I eaſily could, where none at all that I know of hath been hitherto made by any man, I conſidered, that it might afford us ſome light, if we diſcovered at leaſt what proportion, as to bulk, the Air latitant in a quantity of water would have to the liquor it came from, when the Aërial particles ſhould be gathered together into one place. For, though about this union, and the Spring that may be conſequent to it, ſome doubts may be ſuggeſted, which I have not now time to diſcuſſe; yet I ſuppoſed, that at leaſt ſome diſcoveries would by this way be made, though not of the true proportion between the Air and the Water, yet about two or three particulars, in due time to be taken notice of.

To find Inſtruments, which would any way accommodate our purpoſe, proved a very difficult work; ſo that among other things, that we were fain to do, this was one, that to evince how little the Air, latitant in water, did appear to leſſen the bulk of that water, if it were ſuffered to flye away in an open Tube; we ſuffered it to eſcape in an exhauſted Receiver without any artifice to catch it; by which tryal the water did not part with any thing of its bulk, that made a diminution ſenſible to the eye. Wherefore we endeavoured to make this loſs viſible by ſome other tryals, of which I can find but a few haſty memorials among my loſe Entryes.

A Chymical pipe ſealed at one end, and 36 inches (or ſomewhat leſs) in length, was fill'd with water, and inverted into a glaſs veſſel, not two inches in diameter, and but $\frac{1}{4}$ of an inch or little more in depth. Theſe glaſſes being conveyed into a fit Receiver, and the Air being leiſurely pumped out, and ſomewhat ſlowly readmitted, the numerous bubbles, that had aſcended during the operation, conſtituted at the top an Aërial Aggregate, mounting to $\frac{8}{16}$ wanting about 100 part of an inch.

Theſe are two Experiments.

Preſently after, the Tube (by and by to be deſcribed) was filled again with the ſame water, and inverted, and the water being drawn down to the ſurface of the veſſelled water, and the Air let in again, the water was impelled up to the very top within a 10*th*. and half a tenth of an inch.

The Tube for meaſuring the Air latitant in water was $43\frac{1}{2}$ inches above the ſurface of the ſtagnant water: the Air collected out of the bubbles at the top of the water, was the firſt time $\frac{1}{4}$ of an inch and ſomewhat better; the ſecond time we eſtimated it but $\frac{1}{8}$ and $\frac{1}{16}$. The firſt time the water in the pipe was made to ſubſide full as low as the ſurface of the reſtagnant water: the ſecond time the lowest, we made it ſubſide, ſeemed to be 4 or 5 inches above the ſurface of the water in the open veſſel.

Matter of *fact* thus recited would afford divers difficulties worthy to be conſidered, which I have not leiſure to diſcuſſe; eſpecially the Odd thing that happens to the Aërial particles of water: For though, whilſt they lay concealed in the water, they took up ſo little room in it, that it was inſenſible, and when they were permitted to eſcape out of the Tube, the water was not manifeſtly diminiſhed by their receſſe; yet when they were aſſociated at the top of the Tube, their aggregate did ſometimes maintain a place, that was conſiderable enough in reference to the capacity of the whole Tube; though I muſt here advertiſe, that this Aggregate did at the top of the Tube poſſeſs more room than its bulk did abſolutely require, becauſe it was ſomewhat defended from the preſſure of the Atmoſphere by the weight of the ſubjacent Cylinder of water, which might be about three or four foot long.

Quere: Whether any conſiderable proportion of Bubbles will be afforded by the ſame liquor, if it be ſuffered to continue in the glaſs for ſome competent time, after it has been once, or oftener, freed from bubbles already?

Quere: How far it may be worthy our conſideration, whether in common water there may not be concealed Air enough to be of uſe to ſuch cold Animals as *Fiſhes*; and whether it may be ſeparable from the water, that ſtrains through their gills?

But though I was at firſt content to make uſe of this way of eſtimating the Air concealed in water, yet when I came where I could be a little better accommodated with glaſſes, I bethought my ſelf of a ſmall Inſtrument, that would much better diſcloſe the wonderful plenty of the Aerial particles I deſigned to diſcover. The ſtructure and uſe of this Glaſs may be eaſily enough underſtood by the recital of the firſt Experiment, that was made with it, whereof take the following *Tranſcript*.

We provided a clear round Glaſs, furniſhed with a pipe or ſtem of about 9 inches in length, the globulous part of the glaſs being on the outſide about 3½ inches in diameter; the Pipe of this glaſs was within an inch of the top, melted at the flame of a Lamp, and drawn out for two or three inches as ſlender as a Crow's-quill, that the decrement of the water upon the Receſſe of the Air, harboured in its pores, might, if any ſhould happen, be the more eaſily obſerved and eſtimated. Above this ſlender part of the Pipe, the Glaſs, as was before intimated, was of the ſame largeneſs (or near it) with the reſt of the Pipe, that the Aerial bubbles, aſcending through the ſlender part, might there find room to break, and ſo prevent the overflowing, or loſs of any part of the water.

This

This Veſſel being not without difficulty and ſome Induſtry filled, till the liquor reached to the top of the ſlender part, where not being uniformly enough drawn out, it was ſomewhat broader than elſewhere; we conveyed the Glaſs, together with a pedeſtal for it to reſt upon, into a tall Receiver, and pumping out the Air, there diſcloſed themſelves numerous bubbles aſcending nimbly to the upper part of the Glaſs, where they made a kind of froth or foam; but by reaſon of the above-mentioned figuration of the Veſſel, they broke at the top of the ſlender part, and ſo never came to overflow.

This done, the pump was ſuffered to reſt a while, to give the Aerial particles, lodged in the water, time to ſeparate themſelves and emerge, which when they had done a pretty while, the pump was plyed again, for fear ſome Air ſhould have ſtolen into ſo large a Receiver. Theſe viciſſitudes of pumping and reſting laſted for a conſiderable time, till at length the bubbles began to be very rare, and we weary of waiting any longer; ſoon after which the external Air was let into the Receiver, and it appeared ſomewhat ſtrange to the Spectators, that notwithſtanding ſo great a multitude of Bubbles, as had eſcaped out of the water, I could not by attentively comparing the place where the ſurface of the water reſted at firſt (to which a mark had been affix'd) with that where it now ſtood, I could not, I ſay, diſcern the difference to amount to above, if ſo much, as an hairs breadth; and the chief Operator in the Experiment profeſſed that, for his part, he could not perceive any difference at all.

Thus far for the Narrative of the tryal made by *Water*; but that was not the only Liquor, into whoſe Aerial particles I deſigned by our little Inſtrument to enquire; and therefore filling a Glaſs of the ſame ſhape, and much of the ſame bigneſs, with *Claret wine*, and placing it upon a convenient Pedeſtal in a tall Receiver, we cauſed ſome of the Air to be pumped out; whereupon in a ſhort time there emerged, through the ſlender Pipe, ſo very great a multitude of Bubbles, that were darted, as it were, upwards, as did not a little both pleaſe and ſurprize the Beholders: but it forced us to go warily to work, for fear the Glaſs ſhould break, or the wine overflow. Wherefore we ſeaſonably left off pumping, before the Receiver was any thing near exhauſted, and ſuffered the Bubbles to get away as they could, till the preſent danger was overpaſſed, and then from time to time we pump'd a little more Air out of the Receiver, till we were weary, the withdrawing of a moderate quantity of Air at a time ſufficing, even at the latter end, to make the Bubbles not only copiouſly, but very ſwiftly aſcend, (by a minute Watch) for above a quarter of an hour together.

The little Inſtrument, made uſe of about theſe tryals, being deſigned to examine, among other things, the quantity of Bubbles lurking in ſeveral Liquors, is to be applyed to *Spirit of Wine* and *Chymical Oyles*, that are more ſubtil Liquors than Wine it ſelf. And ſome circumſtances of our tryals made us think, that it might be worth examining, what kind of ſubſtance may be obtained by this way of handling Aerial and Spirituous Corpuſcles. But of the other uſes of our Inſtrument elſewhere.

The VI. Title.

Of ſome Phænomena, afforded by Shell-Fiſhes *in an exhauſted Receiver.*

Experiment the 1.

AN *Oyſter* being put into a very ſmall Receiver, and kept in long enough to have ſucceſſively kill'd three or four Birds or Beaſts, *&c.* was not thereby kill'd, nor, for ought we could perceive, conſiderably diſturb'd; only at each ſuck we perceiv'd, that the Air contain'd between the two Shells broke out at their Commiſſure; as we concluded from the foam which at thoſe times came forth all round that Commiſſure. About twenty four hours after, coming to ſee in what condition this Oyſter was, I found, that both this, and another that had been put at the ſame time into the Receiver, were alive; but how long afterwards they continued ſo, I did not obſerve.

Experiment the 2.

That ſame day we put a pretty large *Craw-Fiſh* into a pretty large Receiver, and found, that though he had been injur'd by a fall before he was brought thither, yet he ſeem'd not to be much incommoded by being included, till the Air was in great meaſure pump'd out, and then its former motion preſently ceaſed, and he lay as dead; till, upon the letting in a little Air into the Receiver, he began fortwith to move afreſh. And upon the withdrawing the Air again, he preſently, as before, became moveleſs. Having repeated this tryal two or three times, we took him out of the Receiver, where he appear'd not to have ſuffer'd any harm.

Experiment the 3.

But I thought it not unlikely, that there may be ſome ſuch inequality in the ſtrength or vivacity of Animals, as to ſuch kind of Experiments as ours, that it might be well worth while in ſeveral caſes to reiterate our Tryals. And on this occaſion I ſhall here add, that having put an *Oyſter* into a viol full of Water, before we included it in the Receiver, that through the liquor the motion of the Bubbles, expected from the Fiſh, might be the more pleaſantly ſeen and conſider'd, this Oyſter prov'd ſo ſtrong, as to keep it ſelf cloſe ſhut, and repreſs'd the Eruption of the Bubbles, that in the other did force open the ſhells from time to time; and kept in its own Air as long as we had occaſion to continue the Tryals.

Experiment the 4th.

Moreover a *Craw-Fiſh*, that was thought more vigorous, being ſubſtituted in the place of the former Craw-Fiſh, though once he ſeem'd to loſe his motion together with the Air, yet afterwards he continued moving in the Receiver, in ſpight of our pumping: Whether becauſe there was ſome unperceiv'd leaking, that hindred a ſufficient Exhauſtion of the Air, or becauſe this particular Animal was more ſtrong or vivid than the other, we could not poſitively determine.

The VII. Title.

Of the Phænomena of a Scale-Fiſh *in an Exhauſted Receiver.*

THe following Experiment is far from being the firſt that was made on a Scale-Fiſh in our *Vacuum*; but in regard that the Receivers, wherein thoſe tryals were made, the External Air could not be kept out near ſo long, and ſo well as in the Veſſel I am about to mention, I judg'd it well worth the pains to obſerve, what would happen to a Fiſh in an exhauſted Veſſel, where it ſhould be kept for ſome hours together from all ſupply of freſh Air. And therefore I made ſeveral Tryals to that purpoſe; whereof that, which I think the moſt conſiderable, was Regiſtred as follows:

We took a Receiver ſhap'd almoſt like a Bolthead, containing by eſtimation near a Pint, and the Globulous part of it being almoſt half full of water, we put into it, at the *Orifice* (which was pretty large) a ſmall *Gudgeon*, about three Inches long, which when it was in the Water ſwam nimbly up and down therein. Then having drawn out the Air ſo well, that we gueſs'd by a Gage, that about nineteen parts of twenty or more might be exhauſted, we ſecur'd our ſelves, that the regreſs of the Air ſhould not injure our Experiment; about which we obſerv'd theſe particulars.

Firſt, The neck of the Glaſs being very long, though there appeared great ſtore of Bubbles all about the Fiſh; yet the reſt of the Water, notwithſtanding the withdrawing of ſo much Air as has been mention'd, emitted no froth, and but few Bubbles.

Secondly, The Fiſh both at his mouth and gills did, for a great while, diſcharge ſuch a quantity of Bubbles as appear'd ſtrange, and for about half an hour or more (for much longer I had not opportunity to watch it;) when ever he reſted a while, new Bubbles would adhere to many parts of his Body (as if they were generated there) eſpecially his Fins and Tayle: So that he would appear almoſt beſet with Bubbles; and if, being excited to ſwim, he was made to ſhake them off, he would quickly, upon a little Reſt, be beſet with new ones as before.

Thirdly, Almoſt all the while he would gape and move his Gills, as before he was included; though towards the end of the time that I watch'd, it often happen'd, that he neither took in, nor emitted any Aerial particles that I could perceive.

Fourthly, After a while he lay almoſt conſtantly with his Belly upwards, and yet would in that poſture ſwim briſkly as before.

Fifthly, Nay after a while he ſeem'd to be more lively than at firſt putting in; whether by reaſon, that by diſcharge of ſo many Bubbles, which by their diſtenſion perhaps put him to pain, he found himſelf reliev'd, or for ſome other cauſe, I examine not.

Having occaſion to go abroad, I return'd about an hour and a half after he had been ſeal'd up, and found him almoſt free from Bubbles, and with his Belly upwards, and ſeeming ſomewhat tumid, but yet lively as before. But an hour and a quarter after that, when riſing from dinner I went to look upon him again, he ſeem'd to be moveleſs and ſomewhat ſtiff; yet upon ſhaking the Glaſs, obſerving ſome faint ſigns of life in him by ſome Languid motions, he attempted to make when excited to them, I open'd the Receiver under water, to try if that Liquor and Air would recover him; and the external water ruſhing in till it had fill'd the vacant part of the Ball and the greateſt part of the ſtem too, the Fiſh ſunk to the bottom of it, with a greater appearance than ever of being alive; in which ſtate after he had continu'd a pretty while, I made a ſhift, by the help of the water he ſwam in, to get him through the Pipe into a Baſon of water, where he gave more manifeſt ſigns of life: but yet for ſome hours lay on one ſide or other, without being able to ſwim or ly on his belly, which appear'd very much ſhrunk in, as if ſomething during the time of its being ſeal'd up had been broken in his body, or his Belly had been exceedingly diſtended, beyond reſtitution to its former Tone.

All the while he continued in the Baſon of water, though he mov'd his Gills as before he had been ſeal'd up; yet I could not perceive, that he did, even in his new water, emit, as formerly, any Bubbles, though two or three times I held him by the Tayl in the Air, and put him into the Water again; where at length he grew able to lye conſtantly upon his Belly (which yet retain'd much of its former lankneſs;) and though it be now about or above twenty four hours ſince he was firſt included, he continues yet alive.

(*Poſtſcript.* He liv'd in the Baſon eight or ten dayes longer; though divers Gudgeons ſince taken dy'd there in much fewer dayes.)

The VIII. Title.

Of two Animals included, with large wounds in the Abdomen, in the Pneumatical Receiver.

Experiment the I.

Sep. 12. A Small *Bird*, having the Abdomen opened almoſt from flank to flank, without injuring the Guts, was put into a ſmall Receiver, and the Pump being ſet a work continued for ſome little time without giving any ſigns of diſtreſs, but at the end of about a minute and an half from the beginning of the exhauſtion, ſhe began to have convulſive motions in the wings; and though the convulſions were not univerſal, or did appear violent, as is uſual in other Birds from whom the Air is withdrawn by the Engin, yet at the end of two full minutes, letting in the Air, and then taking off the Receiver we found the Bird irrecoverable; notwithſtanding which we did not find any notable alteration in the Lungs, and found the Heart (or at leaſt the Auricles of it) to be yet beating, and ſo it continued for a while after.

Experiment the 2.

The ſame day.

We took alſo a pretty large *Frog*, and having without violating the Lungs or the Guts made two ſuch inciſions in the Abdomen, that the two curled bladders or lobes of the Lungs came out almoſt totally at them, we ſuſpended the Frog by the legs in a ſmall Receiver, and after we had pumped out a good part of the Air, the Animal ſtrugled very much, and ſeemed to be much diſordered, and when the Receiver was well exhauſted, ſhe lay ſtill for a while as if ſhe had been dead, the Abdomen and thigh very much ſwelled, as if ſome rarified Air or Vapor forcibly diſtended them. But as, when the Frog was put in, one of the Lobes was almoſt full, and the other almoſt ſhrunk up, ſo they continued to appear, after the Receiver had been exhauſted; but upon letting in of the Air, not only the body ceaſed to be tumid, but the plump bladder appeared for a while ſhrunk up as the other, and the Receiver being removed, the Frog preſently revived, and quickly began to fill the Lobe again with Air.

The IX. Title.

Of the motion of the ſeparated Heart of a Cold Animal in the Exhauſted Receiver.

Without diſcuſſing the opinions of Learned men about the connexion and dependency of the Motion of the Bloud, and Beating of the Heart, I thought, it might give me a ſufficient inducement to make the following Experiment, that ſeveral ſorts of Animals would be preſently killed in our *Vacuum* by the withdrawing of the Air, and even the Inſects mentioned in the formerly publiſhed *Digreſſion* about Reſpiration, though they alſo were not totally deprived of *life* by the abſence of the Air, yet they were of *viſible motion*: Wherefore ſome good hint or other being to be hoped for from the diſcovering, whether or no a ſeparated Heart, which is but a part of an Animal, would continue its motions in our *Vacuum*; we made ſome tryals to that purpoſe, whoſe ſucceſs I find thus ſet down.

Experiment the 1.

The Heart of an *Eele* being taken out and laid upon a plate of Tin in a ſmall Receiver, when we perceived it to beat there as it had done in the open Air, we exhauſted the Veſſel, and ſaw, that, though the heart grew very tumid, and here and there ſent forth little Bubbles, yet it continued to beat as manifeſtly as before, and ſeemed to do ſo more ſwiftly; as we tryed by numbring the pulſations it made in a minute, whilſt it was in the exhauſted Receiver, and when we had readmitted the Air, and alſo when we took it out of the Glaſs, and ſuffered it to continue its motion in the open Air. The heart of an other Eele, being likewiſe taken out, continued to beat in the emptied Receiver, as the other had done.

Experiment the 2.

The Heart of an other Eele, after having been included in a Receiver firſt exhauſted, and then accurately ſecured from leaking, though it appeared very tumid, continued to beat there an hour; after which, looking upon it and finding its motion very languid, and almoſt ceaſed, by breathing a little upon that part of the glaſs where the heart was, it quickly regained motion, which I obſerved a while; and an hour after finding it to ſeem almoſt quite gone, I was able to renew it by the application of a little more warmth. At the end of the third hour, coming to look at it once more, a bubble, that appeared to be placed between the Auricle and the Heart, ſeemed to have now and then a little trembling motion; but I found it ſo faint, that I could no more by warmth excite it, ſo as plainly to perceive the heart to move: wherefore I ſuffered the outward Air to ruſh in, but could not diſcern, that thereby the heart regained any ſenſible motion, though aſſiſted with the warmth of my breath and hands.

The X. Title.

A Compariſon of the Times wherein Animals may be kill'd by Drowning, or withdrawing of the Air.

TO help my ſelf and others to judge the better of ſome difficulty's concerning Reſpiration, I thought it might be uſeful, that we compar'd together the Times, wherein Animals may be kill'd by *that want* of Reſpiration, which in thoſe that are drown'd is cauſed by the water that ſuffocates them, and *that other* want, which proceeds from withdrawing the ambient Air. Of the *latter* of theſe a ſufficient number of Inſtances is to be met with among our other Experiments, and therefore I ſhall now ſubjoyn about the *former* the more Tryals, becauſe this Compariſon hath not, that I know of, been yet thought on by any.

Experiment the 1.

Sept. 10. A *Green-Finch*, having his legs and wings tyed to a weight, was gently let down into a glaſs-body fill'd with water; the time of its total immerſion being mark'd : At the end of half a minute after that time the ſtruglings of the Bird ſeeming finiſh'd, he was nimbly drawn up again, but found quite dead.

Experiment the 2.

Whereupon a *Sparrow*, that was very luſty and quarrelſome, was ty'd to the ſame weight, and let down after the ſame manner; but though he ſeem'd to be under water more vigorous than the other Bird, and continued ſtrugling almoſt to the very end of half a minute from the time of his being totally immers'd (during which ſtay under water there aſcended, from time to time, pretty large bubbles from his mouth,) yet notwithſtanding, that as ſoon as ever the half minute was compleated, he was drawn up, we found him, to our wonder, irrecoverably gone.

Experiment the 3.

A ſmall *Mouſe*, being held under water by the tail, emitted from time to time divers Aerial Bubbles out of his mouth; and at laſt, as one of the Spectators affirm'd, he ſaw at one of his Eyes, being taken out at the end of half a minute and ſome few ſeconds, he yet retain'd ſome motions; but they prov'd but Convulſive ones, which at laſt ended in Death.

By what is related under the I. Title, *it does not appear, that* Water-Fowl, *at leaſt that* Ducks *could in our Receivers endure the want of Air much longer than other Birds: But now to ſhew, that the Contrivance of Nature is not inſignificant, as to the enabling them to continue much longer under Water, without freſh Air, than the* Land-birds *abovemention'd, it will not be amiſs, to ſubjoyn the two following Experiments.*

Experiment the 4th.

We took the *Duck* mention'd in the *I. Title*, and ſo ty'd a conſiderable weight of Lead to her body, as it did not hinder her Reſpiration, and yet would be ſure to keep her down under water; which we had found that a ſmall weight would not do by reaſon of her ſtrength, nor yet a great weight, if ty'd only to her feet, in ſuch a middle-ſiz'd Tub as ours was, becauſe of the height of her neck and beak. With the above-mention'd Clog, the Duck was put into a Tub full of clear water, under whoſe Surface ſhe continued, about a minute by my Watch, quietly enough, but afterwards began to appear for a while much diſturb'd; which fit being over, our not perceiving any motion in her made us, at the end of the ſecond minute, take her out of the water, to ſee in what condition ſhe was, and finding her in a good one, after we had allowed her ſome breathing time to recruit her ſelf with freſh

Air,

Air, we let her down again into the Tub, which in the mean time had been fill'd with freſh water, leaſt the other, which had been troubled with the ſteams and foulneſs of the Ducks Body, might either haſten her death by its being infected with them, or hinder our diſcerning what ſhould happen, by its being opacated by them.

The Bird being thus under water did, after a while, begin, and from time to time continue, to emit divers Bubbles at her Beak. There alſo came out at her Noſtrils divers real Bubbles from time to time; and when the Animal had continued about two minutes or better under water, ſhe began to ſtruggle very much, and to endevour either to emerge or chang Poſtures; the latter of which ſhe had liberty to do, but not the former. After four minutes, the Bubbles came much more ſparingly from her: then alſo ſhe began to gape from time to time, (which we had not obſerv'd her to do before,) but without emitting Bubbles; and ſo ſhe continued gaping till near the end of the ſixth minute, at which time all her motions, ſome of which were judg'd convulſive, and others that had been excited by our rouzing her with a *forceps*, appear'd to ceaſe and her head to hang careleſly down, as if ſhe were quite dead. Notwithſtanding which, we thought fit for greater ſecurity to continue her under water a full minute longer, and then finding no ſigns of life, we took her out. and being hung by the heels, and gently preſs'd in convenient places, ſhe was made to void a pretty quantity of water, of which whether any had been receiv'd into the Lungs themſelves; we had not time and opportunity to examine. But all the means, that were to recover the Bird to life, proving Ineffectual, we concluded, ſhe had been dead a full minute before we removed her out of the water: So that, to ſum up the Event of our Experiment, even this Water-Bird was not able to live in Cold water, without taking in freſh Air, above ſix minutes; which is but $\frac{1}{10}$ of an hour.

Experiment the 5th.

The *Duckling* mention'd in the *I. Title* and *ſecond Experiment*, having a competent weight tyed to her legs, was let down into a Tub of Water which reached not above an inch or two higher than her Beak: during the moſt part of her continuance, there came out ſtore of Bubbles at her Noſtrils, but there ſeem'd to come out more and greater, from a certain place in her head almoſt equidiſtant from her eyes, but ſomewhat leſs remote from her Neck than they. Whilſt ſhe was kept in this condition, ſhe ſeem'd frequently to endeavour to dive lower under water, and after much ſtrugling and frequent gaping, ſhe had divers convulſive motions, and then let her Head fall down backward, with her Throat upwards. To which moveleſs poſture ſhe was reduc'd at the end of the third minute, if not a little ſooner; but a while after there appear'd a manifeſt but tremulous motion in the two parts of her Bill, which continued for ſome time, but afforded no Circumſtances, whereby we could be ſure, that they were not Convulſive Motions; but theſe alſo ceaſing upon the end of the fourth minute, the Bird was taken out and found irrecoverable.

Experiment the 6th.

A *Viper* that was kept ſo many hours in an Exhauſted Receiver, till it was concluded to be ſtark dead, and to have been ſo for a good while, was nevertheleſs reſolutely hindered by me from being thrown away, till I had try'd, what could be done by keeping it all night in a glaſs-body upon a warm digeſtive Furnace. Whereupon this Viper was found the next morning not only to be reviv'd, but to be very lively, ſo as to invite me to make with Her, without ſeeking for another, the following Experiment.

We put her into a tall Glaſs-body, fitted with a Cork to the Orifice of it, and depreſs'd with weight, ſo that ſhe could come at no Air. In this caſe we obſerv'd her from time to time; and after ſhe had been duck't a while, ſhe lay with very little motion for a conſiderable ſpace of time. At an hour and a quarter ſhe often put out her black tongue: at near four hours ſhe appear'd much alive, and, as I remember, about that time alſo put out her tongue, ſwimming all this while, as far as we obſerv'd, above the bottom of the water. At the end of about ſeven hours or more, ſhe ſeem'd yet to have ſome life in her, her poſture being manifeſtly chang'd in the Glaſs, from what it was a while before; unleſs that might proceed from ſome difference made in her Body as to Gravity and Levity. Not long after ſhe appear'd quite dead, her head and tayl hanging down moveleſly, and directly towards the bottom of the veſſel, whilſt the middle of the Body floated as much as the above-mention'd Cork would permit it.

Haſte maketh me pretermit the mention of divers things ſuggeſted by what hath been delivered upon the preſent *Title*. But this one thing would be taken notice of, that, though ſome of the abovementioned Animals ſeem, by the Relations we have given of them, to have been a little ſooner deſtroyed by drowning, than any we have mentio'nd were by our Engin, that is no ſure proof, that ſuffocation does kill Animals faſter, than the deprivation of Air, they are expoſed to in our Engin. For in drowning, that which deſtroys is applyed to its full vigour at the very firſt, and all at once; whereas, our Receivers being made for ſeveral purpoſes, the Deprivation of the Air, that they make, cannot be made all at once, but the Air muſt be pump't out by degrees; ſo that till the laſt the Receiver will be but partly emptied. For confirmation of which, I have this to alledge, that, having in the preſence of ſome *Virtuoſi* provided for the nonce a very ſmall Receiver, wherein yet a Mouſe could live ſometime, if the Air were left in it, we were able to evacuate it at one ſuck, and by that advantage we were enabled, to the wonder of the Beholders, to kill the Animal in leſs than half a minute.

As

An Accompt of *Three* Books.

I. *De ANGLORVM GENTIS ORIGINE DISCEPTATIO, Auth.* Rob. Sheringhamo *Cantabrigienſi, Colleg. Gonvilii & Caii Socio.* Cantabrigiæ, 1670. in 8°.

THe Learned Author of this Diſcourſe doth therein inquire into the Origine both of the Antient *Britains*, and of the *Angli* or *Engliſh*; having firſt deſcribed the Scituation, Latitude, Form, Fertility, and Temper of the Inhabitants of this *Iſland*. In his Inquiry he finds nothing that may be more certain in ſo great obſcurity, than that the Old *Britains* were deſcended from the *Trojans*, by *Brutus*, the Off-ſpring of *Æneas*; and that the *Angli* are the Race of the *Gothick* Nation (which he maketh the Off-ſpring not of *Japhet*, but of *Sem*:) Further, that the *Getæ* or *Goths* did paſs through *Scythia* into *Scandia* and *Sarmatia*, and from *Scandia* into the Iſles of the *Baltick* Sea and *Germany*; but that under that great Captain *Filemer* they made an Excurſion again into *Aſia*, and having there ejected out of their Seats the *Magogæan Scythians* and the *Cimmerians*, ſetled themſelves and their Empire in *Aſia*; whence the *Saxons*, *Getes* and *Angles*, (the Fore-Fathers of the Engliſh) were brought back again into *Germany*, to the Antient Seat of the *Getes*, under the Conduct of that Famous *Woden* (the Progenitor of the chief Kings of *Europe*) about the year 2910. All which, and much more our Author renders very probable, and in doing ſo, gives proof of much Learning and Induſtry.

II. *A Vindication of HYDROLOGIA CHYMICA, by* William Sympſon *M. D. London, for* R. Chiſwell *in Little Britain*, 1670.

THis Author, eſteeming, that his Antagoniſt, Dr. *Wittie*, hath fallen ſhort in ſtrength of Argument againſt his firſt Book, written upon the *Scarborough-Spaw*, and made ſupplies by groundleſs accuſations, maketh it his buſineſs in this Reply, to Anſwer the moſt material Objections urged againſt him, endeavouring to confirm what he had ſaid before, and adding new Obſervations.

And for a further Diſcovery of the nature of the other Medicinal Waters at *Knaresborough*, he gives a particular Diſcourſe both of the *Sweet-Spaw*, and *Sulphur-Well*, found there; where he propounds ſome Experiments, which, in the Authors opinion, not only demonſtrate the Nature and Eſſence of their conſtitutive Ingredients, but by which alſo any *Simple Spring-Water* may be changed into an *Artificial* Mineral

Water, of the ſame taſt and operation with the *Natural*. And as to the Experiments, which concern the *Sulphur-Water*, and conſequently all other the like *Sulphur-Springs*, he affirms them to be ſuch, as no Author, that he knows, hath taken notice of, believing alſo, that they may yield no very ſmall light for the further advancement of Sulphurous and other Mineral Waters.

And foraſmuch as the Eſſence of the *Scarbrough-Spaw* conſiſts, in his opinion, moſtwhat of an *Aluminous* Salt, he thence, taketh occaſion to give an Accompt of the *Alome-Works* at *Whitby*; deſcribing alſo the Difference betwixt the Natural and Factitious Alome.

To all which he annexeth; *First*, A return to ſome *Queries*, formerly propounded in *N°*. 52. of theſe *Tracts* by D. *Dan. Foot*, concerning Mineral Waters. [Where the Reader is deſired to take notice of the great miſtake of Dr. *Sympſon*, in calling theſe Papers the *Ph. Tranſactions of the R. Society*; which is a great injury to that Illuſtrious Body, theſe Tracts being only the Communications of a ſingle Perſon, who hath alſo heretofore expreſly ſignified ſo much to the World *N°*. 11. of theſe Books; and ſtill ſignifieth the like at the end of every year, in the ſeveral Dedications of the ſame.] *Secondly*, Some Reflexions upon the moſt material Paſſages and Experiments, in a late Treatiſe, printed in *London*, and Entitul'd, *Scarbrough Spaw*, *Spagyrically anatomized by* Dr. *G. Tonſtal*: in which Reflexions, a way is propounded for preventing all Inconveniencies, which may happen to thoſe that drink the ſaid *Spaw*. *Thirdly*, An Examination of the *German-Spaw-Water*, as he found ſome of it ſeal'd up in Bottles in *Holland*. *Fourthly*, Some Obſervations on a Diſſected Woman, who dyed of the *Jaundice*.

Through the whole Book are to be met with, divers Obſervations, Experiments, and Hints, which may give occaſion to the *Reader* to improve the ſeveral Subjects, which they relate to. Among other particulars, he inſinuates, that he knows, by a *Diſſolvent*, not rare among Chymiſts, with the addition of a Man's breath, to calcine a Metal, *via humida*, without which (or ſomething equivalent thereto) the humid Calcination of that Metal cannot be perform'd; *item*, How to melt another Metal (prepared after a certain manner) with the help of one ſingle Lamp, un-aſſiſted by any blaſt; *item*, That ſome *Menſtruum's* may diſſolve or break in pieces the cloſe riveted parts of compact Bodies, when yet they leave other Bodies of a ſofter and ſlighter texture untouch'd: which, he adds, giveth light to the poſſibility of finding out by Art ſuch *Menſtruum's*, as may diſſolve and comminute the hard Stone in the Bladder, without touching the ſoft membrane of it, and other entrals: *Item*, That not only *Niter* is afreſh to be got out of the ſame Earth, it was formerly extracted from; but the like is obſerv'd in the Minerals of *Vitriol* and *Alome*; and, which is more, that the Generation of Metals is not terminated with one production, the Tinners in *Cornwal* having found after 30 years, *Tin* generated anew, where it hath been formerly digg'd up and fill'd with Earth. *Item*, That taking a pint of ſimple Spring-water, in which he diſſolv'd betwixt one and two drachms of Sal marine in *Frigido* (ſince about that quantity of Common Salt the *Sulphur-water* in the North contains,) he added to this Solution of Salt in water, about two or three ounces of *Calx Vive* and the Marcaſites of *Vitriol* (found near the *Sulphur-Well*) groſly pulverized; which preſently became conſiderably hot: whereupon pouring off ſome of the Water, he poured into the ſame, filtred, a little Solution of the ſimple *Alome-Salt*; and it immediately cauſed a precipitation of a Sulphur, and ſent forth the very ſmell, and had alſo the exact taſt of the *Sulphur-Well*.

Again; That, ſeeing all Bodies are but Concretions and Hardnings of their primitive Juyces, under various diſguiſes, generally perform'd by the operation of the Air, therefore the Preparation of a Diſſolvent by Art, (which may work wonders in this kind) is no more, to him, than to make ſuch an one, as may ſoften theſe Concretions, made by the Air, and by taking away their hardneſs, reduce them into their firſt Juicy Liquors. Where he obſerveth, that if it were not for the perpetual Circulation of the Juyces in the Body, conſtantly tranſpiring through the pores thereof, we ſhould either become petrified, or be incircled with a Bark.

III. *A Diſcourſe in Vindication of* Des-Cartes's *Syſteme, by* M. Des-Fourneillis: *to which is annexed the* SYSTEME GENERAL *of the ſame* CARTESIAN *Philoſophy, by* Francis Bayle, *M. D. at* Toloſe. *Printed at* London *for* Moſes Pit, *in Litle-Britain*.

Both theſe Tracts were lately *Engliſh't* out of *French*: Of the *latter* of which, whilſt it was yet un-tranſlated, ſome Accompt was given in *Numb.* 54: the *former* ſhews only, that the Syſteme of *M. Des-Cartes* ſeems to have been taken out of the firſt Chapter of *Geneſis*; and particularly, that his Opinion concerning *Brutes* contains nothing dangerous.

Errata.

Pag. 2012. l. 36. r. *was not yet*, p. 2016. l. 18. r. *reſted himſelf*, p. 2023. l. 19. r. *being put*.

LONDON:

Printed by *T. R.* for *John Martyn* Printer to the *Royal Society*, 1670.

Numb. 63.

PHILOSOPHICAL TRANSACTIONS.

September 12. 1670.

The CONTENTS.

The Continuation of the Experiments concerning Reſpiration, *promiſed in the precedent Tract, and communicated by the ſame Noble Author, in* Ten *other Titles;* viz. *Of the Accidents, that happen'd to Animals in Air, brought to a Conſiderable degree of Rarefaction; To which is annex'd a digreſſive Experiment concerning Reſpiration upon very high Mountains. Of the Obſervations produced in an Animal by Changes as to Rarity and Denſity made in the* ſelf ſame *Air. Of an unſucceſsfull Attempt, to prevent the* Neceſſity *of Reſpiration by the Production of Growth of Animals in the* Vacuum Boylianum; *together with two digreſſive Experiments concerning the Expanſion of Bloud, and other Animal juyces, as alſo other ſoft parts, even in cold Animals. Of the power of* Aſſuefaction *to enable Animals to hold out in Air, by rarefaction made unfit for Reſpiration. Some Experiments ſhewing, that Air, become unfit for Reſpiration, may retain its wonted Preſſure. Of the uſe of the Air to elevate the* Steams *of Bodies. Of the long continuance of a* Slow-worm *and a* Leech *alive in the* Vacuum. *Of what happen'd to ſome* Creeping Inſects; *and of the Phænomena ſuggeſted by* Winged Inſects *in the ſame. Of the* Neceſſity *of Air to the motion of ſuch ſmall creatures, as* Ants, *and even* Mites *themſelves. An Accompt of two Books:* I. *TRACTS written by the Honourable* Rob. Boyle, *concerning* Coſmical *Qualities;* Subterraneal *and* Submarine *Regions; the* Bottom *of the* Sea; *together with an Introduction to the Hiſtory of* particular *Qualities.* II. *CATALOGUS PLANTARUM ANGLIÆ, opera* Johannis Raji. *M.A. è Soc. Regia.*

A Preface concerning theſe Experiments

Though to ſhun prolixity, the Preface, *which the Author had made to all he wrote about* Reſpiration, *have been purpoſely omitted; yet there are ſome few points ſo neceſſary to be taken notice of, that 'tis thought unfit to leave them* wholy *untouch'd. For, the following Experiments being not at firſt written for the Preſs, and thrown by for many years, till they were very haſtily gather'd together, and in ſome places ſupply'd with others, little leſs haſtily annex'd to make ſome neceſſary ſupplys the* Reader *muſt not expect in ſuch a Caſuall* Tract *(which the Author confeſſes to be one of the moſt imperfect and immethodicall of all his compoſures) any thing but Novelty, and Truth, and an Earneſt deſire to be ſerviceable in an Inquiry ſo important to Mankind, to the Curious in general, and eſpecially to Phyſitians, who by the incouraging mention they have made of his former endeavours in this kind, have invited him to add theſe many new Experiments to thoſe few, they had hitherto exerciſed their Wits upon; And, to leave them the more freedom to do ſo, he purpoſely forbore to confirm, or confute any* Hypotheſis, *or ſo much as propoſe any of his own, declaring it to be his Aime, not to eſpouſe or make a party, but to communicate to the Curious ſome* matters of fact, *that are new; and in an hiſtorical way impartially delivered. No more of* Preface *is now to be added, but that 'tis thought fit, for prevention of Ambiguity, to give this Advertiſement touching the ground of the Title of* Vacuum Boylianum, *to be met with in theſe Experiments; That as Learned men, both Engliſh and Forreigners, in their writings have famiarly for diſtinction ſake imploy'd the Titles of* Machina Boyliana, *and* Experimenta Boyliana; *ſo the* Author, *that writ theſe, for the moſt part in haſt, and for his own memory, did, for diſpatch ſake, call the abſence of the Air procured in his Receivers* our Vacuum; *whence by Analogy was fram'd the* Vacuum Boylianum, *which he therefore thinks the leſs improper, becauſe to call it* Vacuum *abſolutely, would be judged by many a declaring himſelf a* Vacuiſt, *who does not yet own the being either of* their *opinion, or a downright* Pleniſt; *or elſe he muſt be troubleſome to the Reader and himſelf, by frequently explaining, what ſort of* Vacuum *he underſtands; whereas he declares once for all, that by the* Vacuum Boylianum *he means ſuch a Vacuity or Abſence of Common Air, as is wont to be effected or produc'd in the operations of the* Machina Boyliana.

The XI. Title.

Of the Accidents that happen'd to Animals in Air brought to a conſiderable degree, but not near the utmoſt one, of Rarefaction.

IN the Generality of our Pneumatical Experiments upon Animals, it ſuited with our purpoſes, to rarifie the Air as much, and for the moſt part as faſt, as we could; but I had other Tryals in Deſign, wherein an extraordinary degree of Rarefaction, but yet not near the higheſt to which the Air might be brought by our Engin, ſeem'd likelieſt to conduce to my inquiries, and particularly ſeem'd hopefull to afford ſome light in reference to thoſe Diſeaſes and Diſtempers, that are thought primarily to affect the Reſpiratory Organs, or to depend upon ſomething amiſs in Reſpiration.

Wherefore having *Gages*, by the help of which ſuch Experiments might be much better perform'd then elſe they could, I attempted ſeveral of them; ſome of whoſe ſucceſſes I find in the following Memorials.

Experiment 1.

Auguſt 16th.

A *Linote* being put into a Receiver, capable to hold about $4\frac{1}{2}$ pints of water, the Glaſs was well clos'd with Cement and a Cover; but none of the Air was drawn out with the Engine or otherwiſe. And though no new Air was let in, nor any change made in the impriſon'd Air; yet the Bird continu'd there 3 hours without any apparent approach to death: And though it ſeem'd ſomewhat ſick, yet being afterwards taken out, it recover'd and liv'd ſeveral hours.

Experiment 2.

Auguſt 18th.

From the abovemention'd Receiver about half the Air was drawn out, a *Linote* being then in the Glaſs, and in that rarify'd Air (which appear'd by a *Gage* to continue in that ſtate) the Bird liv'd an hour and near a quarter before it ſeem'd in danger of death; after which the Air being let in without taking off the Receiver, ſhe manifeſtly recover'd, and leap'd againſt the ſide of the Glaſs; being taken out into the open Air ſhe flew out of my hand to a pretty diſtance.

Experiment 3.

Septemb. 9th.

We convey'd into a Receiver, capable to hold about $4\frac{1}{2}$ pints of water, a *Larke*, together with the *Gage*, by the help whereof we pump'd out of the Receiver $\frac{3}{4}$ of the Air that was in it before; then heedfully obſerving the Bird, we perceived it to pant very much, ſo that a Learned Phyſitian (from whom I yet diſſented,) judg'd thoſe beatings to be Convulſive: Having continu'd thus for a little above a minute and a half; the Bird fell into a true convulſive Motion, that caſt it upon the back. And although we made great haſt to let in the Air; yet before the Expiration of the Second minute, and conſequently in leſs than half a minute from the time immediately preceding the Convulſion, the Lark was gone paſt all recovery, though divers means were us'd to effect it.

Ex-

Experiment 4.

Preſently after we put into the ſame Receiver a *Greenfinch*, and having withdrawn the Air till it appear'd by the Gage there remain'd but half, we preſently began to obſerve the Bird, and took notice, that, within a minute after, ſhe appear'd to be very ſick, and ſhaking her head, threw againſt the inſide of the Glaſs a certain ſubſtance which I took to be Vomit, and which afterwards appear'd ſo; upon this Evacuation the Bird ſeem'd to recover, and continue pretty well (but not without panting) till about the end of the fourth Minute, at which growing very ſick, ſhe Vomited again (ſhaking her head as at firſt,) but much more unqueſtionably then before, and ſoon after, eat up again a little of her Vomit; at which time (whether that contributed to her Recovery or no) ſhe very much recovered. And tho ſhe had, in all, three fits of Vomiting; yet for the laſt ſeven or eight minutes that we kept her in the Receiver, ſhe ſeem'd to be much more lively then was expected: which may in part be attributed to a little Air that by an accident got in, tho it were immediately pump'd out again. At the end of a full quarter of an hour from the firſt Exhauſtion of the Receiver, the Bird appearing not likely to dye in a great while, and the Engine being needed for other Uſes, we took out the Bird and thereby put a period to the Experiment. *Septemb.* 9th.

Experiment 5.

I now thought it fit to try, Whether, though a Viper would not hold out very many hours in Air brought to as high a Rarefaction, as we could bring it by our Engin, yet to that cold and vivacious Animal, a very ſmall proportion of Air, in compariſon of what was neceſſary to hot Animals, would not ſuffice to keep it alive for a conſiderable time: The Narration of the Experiment I find regiſtred as follows.

A Viper lately bought of the perſon, that at this ſeaſon uſes to take new ones, almoſt from day to day, was included together with a Gage in a portable Receiver, capable to hold about 3½ pints of water. This veſſel being exhauſted, and ſecured againſt the regreſs of the Air, the impriſoned Animal was obſerved from time to time; and obſerved not only to be alive, but nimbly to put out and to draw back its tongue about 36 hours after it was firſt ſhut up; for which reaſon we continued the Veſſel longer in the ſame ſhady place; where at the end of 60 hours looking upon her, as I was going to bed, ſhe appeared very dull and faint, and not likely to live much longer: And the next morning being by ſome occaſions carried abroad, and coming to look upon the Glaſs preſently after dinner, I found her ſtark dead with her mouth open'd to a ſtrange wideneſs; wherefore ſuffering water to be impelled by the outward Air into the cavity of the Receiver, to obſerve how far that veſſel was then emptied of Air, we found by the water that was driven in, and afterwards poured out again and meaſured, that 4 parts of 5, or rather 5 of 6 of the veſſel'd Air (if I may ſo call that which was ſhut up in the Receiver) had been pump'd out: So that in an *April.* 12th.

Air

Air ſo rarify'd as to expand it ſelf to 5 or 6 times its former and uſual dimenſions, our Viper was able to live 60 hours, that we are ſure of, and perhaps might a pretty while longer.

A digreſſive Experiment Concerning Reſpiration upon very high Mountains.

TO illuſtrate what I have taken notice of in the Printed Experiments about the unfitneſs for Reſpiration obſerv'd by the learned *Acoſta* in the high mountains of *Pariacaca*, I ſhall here add, what I have had the curioſity and occaſion to learn from divers Travellers, whom I purpoſely conſulted about theſe matters; whereof you will eaſily believe that not many of them have had opportunity to give Accounts. Meeting with an Eccleſiaſtical Perſon that had viſited thoſe high mountains of *Armenia*, (on one of which, becauſe of their height, the Tradition of the Natives will needs have the *Ark* to have reſted;) I ask'd him, whether thoſe Mountains are really ſo high as is given out, and whether at the top of that he viſited he found any difficulty of *Breathing*. To the *firſt* part of which Queſtion he anſwer'd; That they were really exceeding high (which he might well judge of, having been upon ſome of the moſt famous both in *Europe*, *Aſia*, and *Africa*;) and that he could not come to the top, becauſe of the unpaſſable ſnows: And to the *ſecond* part he reply'd, that whileſt he was in the upper part of the Mountain he plainly perceiv'd, that he was reduc'd to fetch his breath much oftner than he was wont, and than he did before he aſcended the Hill, and after he came down from it. And upon my inquiring, whether or no that difficulty of breathing might not be accidental, or peculiar to him, he told me that he himſelf having expreſt ſome wonder to find himſelf ſo ſhort-winded, the people told him that 'twas no more than happen'd to them when they were ſo high above the plain; it being a common obſervation among them. And I was the more inclin'd both to make inquiry about theſe matters; and to believe what he ſaid, becauſe what he related of their being cover'd with ſnow, and of an odd Temperature of Air, I had learn'd before from a Travailer of another Nation than this Perſon, and a ſtranger to him.

The ſame Churchman, being ask'd by me, Whether he had not in ſome part of *Europe* made the like obſervation (of the difficulty of breathing) told me, that he had done it upon the Top of a Mountain in the Country of *Senenes* in or near the Province of *Languedoc*; which may ſerve to confirm what I am about to relate from the mouth of a Learned Travailer, that was upon the Top of one of the *Pyreneans* that is not very remote from the Mountains we ſpeak of.

This Gentleman, who was a perſon Curious and Intelligent, being Brother in Law to one of the chief Lords of thoſe parts, was by him invited, about the beginning of *September* to viſit a neighbouring Mountain, that is at leaſt one of the higheſt of the *Pyreneans*, which is commonly called *Pic de Midi*, upon whoſe Top, (where a Tent was ſpread for them) they ſtay'd many hours. His Anſwers to the other Queſtions I asked him, are elſewhere related: All that concerns this place being that

I find this ſet down among my Adverſaria ; *viz.* [I alſo inquired of him whether they found the Air at the Top as fit for Reſpiration as Common Air; which he told me they did not, but were fain to breath ſhorter, and oftner than uſuall ; and becauſe I ſuſpected , that might come from their motion, I ask'd, whether they obſerv'd it to ceaſe, when they came down to the Bottom of the Hill, which he told me they plainly did, beſides that they ſtay'd many hours at the Top, too long to continue out of Breath.

But that I may not here conceal any thing, that may conduce to the Diſcovery of the truth in the matter under conſideration, I ſhall here add, that I did ſometimes think it worth further Inquiry, Whether the Sickneſs, if not alſo the Difficulty of breathing, that ſome have been obnoxious to in the uppermoſt parts of *Pariacacha*, and perhaps ſome other high Mountains, may not be imputed not ſo preciſely to the Thinneſs and Rarity of the Air in places ſo remote from the lowermoſt part of the Atmoſphere, as to exclude certain ſteams of a peculiar nature, which in ſome places the Air may be imbued with ? In favour of which ſuſpition I remember, that inquiring once of an intelligent man, who had liv'd ſeveral years in the Iſland of *Teneriffe*, Whether he had been at the Top of the *Pic* of that name, and what he had there taken notice of about the Air ? He anſwer'd me, That he had attempted to go up to the Top of the Mountain, but that, though ſome of the Company were able to do ſo, he and ſome others, before they had reached near ſo high, grew ſo ſick upon the operation they felt of the ſharp Air, and Sulphureous exhalatious which infected it, that they were fain to ſtay behind their Companions, he having already found this effect of thoſe piercing ſteams upon his face (which when he made me this relation, was of a fair complexion) that the skin began to be of a pale-yellow, and even his hair to be diſcolour'd.

The XII. Title.

Of the Obſervations produced in an Animal in Changes as to Rarity and Denſity made in the ſelf-ſame *Air.*

In the Experiments hitherto recited, the Animals that were recover'd from a gaſping Condition, have been ſo, by letting in freſh Air upon them, and not the ſame that had been withdrawn from them. Wherefore I thought it very requiſite to try, Whether the ſame portion of Air, without being renew'd, would, by being expanded much beyond its uſual degree, and reduc'd to it, ſerve to bring an Animal to Deaths door, and revive him again ; ſince by the ſucceſs of ſuch a Tryal, it would notably appear, that the bare change of the conſiſtence of the Air, as to Rarity and Denſity, may ſuffice to produce the abovementioned Effects.

But to deviſe a way to put this Experiment in practice appear'd no eaſy matter ; ſince it required a Receiver that ſhould be tranſparent, & be capable of changing its bulk without ſuffering any Air to get in or out.

To ſurmount theſe difficulties, the firſt thing I thought on was, to take a fine limber and clear Bladder of a ſheep or hogg, made more tranſparent by being anointed with Oyl, which was done on the outſide, that the ſmell of it might leſs offend the Animal to be included. Then we clipp'd off as much of the Bladder at the neck, as was judg'd abſolutely neceſſary to make an Orifice capable of letting in a *Mouſe*; that ſort of Animals being, by reaſon of their ſmallneſs, the fitteſt of thoſe furniſh'd with Lungs and hot blood, we conld procure. And whereas it ſeemed very difficult, when the neck of the bladder was cut off, to make up ſo large an orifice without wrinckles, at which the rarified Air may eſcape; to obviate this inconvenience, we provided a round ſtick ſomewhat leſs then the Orifice; that, the wood being laid over with a cloſe and yielding cement, (for, pitch or the like common ſtuff will not alwaies ſerve the turn) we might be able to tye the bladder faſt and cloſe enough upon the thus fitted ſtopple.

And now to reduce theſe things to practice, and by their help make our deſigned Experiment, we included a *Mouſe* into a Receiver made according to this way, leaving in the bladder as much Air, as we thought might ſuffice him for as long a time as the Experiment was to laſt. Then putting this limber or extenſible Receiver, if I may ſo call it, into an ordinary one of Glaſs, and placing this Engine near a window, that we may ſee through both of them; the Air was by degrees pumped out of the external Receiver, (as for diſtinction ſake I ſhall call it,) and thereupon the Air included in the bladder did proportionably expand it ſelf and ſo diſtend the external Receiver, till being arrived at a degree of Rarefaction, which rendred it unfit for the included Mouſes Reſpiration, I perceived, though with ſome difficulty, in this Animal the ſigns of his being in great danger of ſudden death. Whereupon the outward Air, being haſtily let into the external Receiver, compreſſed the ſwelled bladder to its former dimenſions, and thereby the included Air to its former denſity, by which means the fainting *Mouſe* was quickly revived. Having given him ſome convenient time of reſpite, the Experiment was reiterated with the like ſucceſs, and we doubted not but the third tryal, we made, would have ended as the two former did; but that, whileſt we were conſidering of the ſickneſs of the Mouſe, which, by reaſon of ſome opacity that could ſcarce be avoided in the wrinckled bladder, was not, as to its degree, ſo eaſily taken notice of, it grew irrecoverable by the ſubſequent condenſation of the Air.

N. B. The Confirmation of this by further Experiments will properly fall under another Title.

The XIII. Title.

Of an unſucceſsfull Attempt to prevent the neceſſity of Reſpiration by the Production *or* growth *of Animals in our Vacuum.*

Having had frequent occaſions to obſerve, how quickly thoſe Animals, whoſe Blood is actually warm, did expire in our *Vacuum*; and that even thoſe Animals with Lungs, whoſe Blood was actually cold, were not able to live any conſiderable time there; I thought it very well worth while, and yet extreamly difficult, to try, whether there might not be ſome wayes yet unpractiſed, either to make ſuch Animals as Nature endows with Lungs, live without Reſpiration, or at leaſt to bring ſuch *Inſects*, and other Animals, as can already live without Air, to move alſo without it in our *Vacuum*.

Therefore conſidering with my ſelf what happens to *Infants* and other young Animals in the Womb, and even after they come from thence, if they continue to be wrapt up in the *Secundines*; though as ſoon as they are brought into the free Air they may be preſently killed by being kept from breathing: Conſidering alſo, what I elſewhere relate of the ſlow Expiration of a very young *Kitling* in our *Vacuum*; together with the long want of Reſpiration, which Cuſtome enables ſome *Divers* to endure: Conſidering theſe things, I ſay; though I know, that ſomewhat may be objected to ſhew, that theſe Inſtances are not altogether full to my purpoſe; yet they, among other things, invited me to think, that the leaſt unlikely projects, that occurr'd to my barren Invention, would be theſe that follow.

Firſt, I thought fit to try, Whether the *Seeds* of reſpiring Animals might be either hatched or otherwiſe brought to produce Young ones in our *Vacuum*. For, if that could be compaſſed, I ſhould obtain my end.

Next, in caſe of my failing in the former attempt, and that, which is to be after a few Lines propoſed, I thought fit to try, whether at leaſt I could not bring the *Eggs* of Inſects to hatch or be animated; or *Aurelias* (as they call them) that were already alive, turn according to the courſe of Nature, into *Winged Inſects*, as Flies or Butter-fiſhes: (of which tryals and thoſe of the former ſort, the account properly belongs to another place, where I relate the ſucceſs of theſe and other attempts to produce Plants and Animals in our *Vacuum*.)

But *thirdly*, Conſidering that Nature has ſo ordered it, that *Froggs*, though when they are grown big enough to deſerve that name, they be amphibious Animals endowed with Lungs; yet before they attain to that pitch, they live wholy in the water like Fiſhes; I thought it the moſt expeditious and leſt improbable attempt we could make, to try, Whether or no this Animal, being as a Fiſh brought to live either in our *Vacuum*, or at leaſt in highly rarified Air, would not continue to do ſo, after its Lungs ſhould be perfectly formed. Wherefore though I foreſaw and foretold the difficulty, that would be met with in the proſecution of this Experiment, namely that the Aereal Bubbles, that would be diſcloſed in ſuch ſoft Bodies upon the withdrawing of the preſſure of the ambient, would ſo violate the ſlight Texture of thoſe tender Animals, as to hinder them from living long or moving freely; yet I thought it very fit to attempt the Tryal, whereof I find this account among my Adverſaria.

Experiment 1.

We took a good Company of *Tadpoles*, and put them with a convenient quantity of water into a Portable Receiver of a round figure, and obſerved, that at the firſt exuction of the Air they did riſe to the top of the water, though moſt of them ſubſided again, till the next exuction raiſed them. They ſeemed by their active and wrigling motion to be very diſcompoſed. The Receiver being exhauſted, they continued reſtleſs moving all of them in the top of the water, and though ſome of them ſeemed to endeavour to go to the bottom, and dived ſome part of the way, eſpecially with their heads, yet they were immediately boyed up again. Within an hour or a little more they were all moveleſs, and lay floating on the water; wherefore I opened the Receiver, upon which the Air ruſhed in, and almoſt all of them (which were many) preſently ſunk to the bottom, but none of them recovered to Life.

Experiment 2.

A little after theſe, we included a leſſer number of *Tadpoles* in a ſmaller Glaſs, which was alſo exhauſted with the like circumſtances with the former. And when I found the other *Tadpoles* to be dead, I haſted to theſe, which did not, except perhaps one, give any ſign of Life; but upon letting in the Air, theſe having not been long kept from it, ſome few of them did recover, and ſwam up and down lively enough for ſome time; though after a while they alſo dyed.

Experiment 3.

Some years after I repeated the ſame Experiment in a portable Receiver of a convenient kind, and though after the Exhauſtion was perfected, the Tadpoles did for a while move briskly enough on the top of the water (none of them appearing able to dive or ſwim under water) yet coming to look on them at the end of an hour, they ſeemed to be all of them quite dead, yet continued floating. And though within half an hour after that, I let in the Air upon them, yet all the effect of it was, that the moſt of them immediately ſunk to the bottom, as the reſt of them did a very little while after; none of them, that I could obſerve, recovering any vital motion.

Experiment 4.

There remains an Experiment, which I often judged as well more hopefull as more noble, if I could procure an opportunity to bring my deſign to a tryal, which I have found it very difficult to do; nevertheleſs I was able to do it once, though not fully as I deſired, yet not altogether without ſucceſs.

We procured then, and with much adoe, ſome of thoſe odd Inſects, which I elſewhere deſcribe, whereof *Gnats* have by ſome ingenious men been obſerved to be generated about the end of *Auguſt*, or beginning of *September*. Theſe for ſome weeks live all together in the water (as *Tadpoles* do ſwimming up and down therein, till they are ripe for a tranſmigration into flyes: which it ſelf is ſo great a Rarity in Nature, as makes theſe little Creatures recompence to our Curioſity the trouble, they often

ten give our faces and hands. Suppoſing then that, if I could get ſome of theſe, and include them, being of thoſe Inſects they call *Aquatilia*, and ſo minute as they are, they may live a great while in the Receiver without Air, and in the mean while attain the Period, which, according to natures courſe, is wont to turn them into flyes, which might come forth winged Creatures into a Medium not furniſhed with common Air, as others of their kind enjoy; ſuppoſing, I ſay, that theſe Inſects would afford me ſome information about theſe particulars, having upon much watching met with four or five of them after a ſhower of Rain, that dropt from a houſe into a veſſel laid on purpoſe for it, we included them with ſome of their water into a ſmall Glaſs Receiver, which being very exactly cloſed, we kept in a South-window, where theſe little Creatures continued to ſwim up and down for ſome few dayes without ſeeming to be much incommodated by ſo unuſual an habitation; and at the end of that time, and much about the ſame day, they deveſted the habit they had, whileſt they lived as fiſhes, and appeared with their *Exuviæ* or caſt coats under their feet, ſhewing themſelves to be perfect *Gnats*, that ſtood without ſinking upon the ſurface of the water, and diſcovered themſelves to be alive by their motion, when they were excited to it: but I could not perceive them to fly in that thin medium; to which inability, whether the viſcoſity of the water might contribute, I know not; though they lived a pretty while, till hunger or cold deſtroyed them. Some thing in this Experiment may deſerve ſerious Reflections; which I cannot ſpare time to offer at.

A Digreſſive Experiment concerning the Expanſion of Blood and other Animal Juyces.

For ſome purpoſes, relating partly to Reſpiration, and partly to other Enquiries, I thought fit to endeavour to obtain what information could be procured, of the Conſiſtence and Diſpoſition to expand it ſelf of *Blood* and other Animal Liquors; In purſuance of which the enſuing tryals, among others, were undertaken.

The warm Blood of a Lamb or a Sheep being taken as it was haſtily brought from the Butchers, where the Fibers had been broken to hinder the coagulation, was in a wide mouth'd Glaſs put into a Receiver, made ready for it; and the pump being early ſet on work, the Air was diligently drawn out: but the Operation was not alwaies, eſpecially at firſt, ſo early manifeſt, as the Spirituouſneſs of the Liquor made ſome expect; yet this hindered not but after a long expectation, the more ſubtle parts of the Blood would begin to force their way through the more clammy ones, and ſeem to boyle in large cluſters, ſome as big as great Beans or Nutmeggs; and ſometimes, to the wonder of the by-ſtanding Phyſitians, the Blood was ſo Volatile, and the expanſion ſo vehement, that it boyled over the containing Glaſs; of which, when it was put in, it did not, by our eſtimate, fill above a quarter. Having alſo included ſome *Milk* warm from the Cow in a Cylindrical veſſel of about four or five inches high, though the Operator were induced to pump a great while before any intumeſcence appeared in the milk, yet afterwards, when the external Air was fully withdrawn, the white liquor began to boyle in a way that was not ſo eaſy to deſcribe, as pleaſant to behold: And this it did for a pretty while with ſo much impetuoſity, that it threw up ſeveral parts of it ſelf out of the wide mouthed Glaſs that contained it (and could have contained as much more) though there were not above two or three ounces of the liquor.

A yet greater diſpoſition to intumeſcence we thought we obſerved in the *Gall*, which was but ſuitable to the viſcoſity of the Texture.

Note, that the two foregoing Experiments were made with an Eye caſt upon the inquiry, that I thought might be made; Whether, and how far the deſtructive operation of our Engin upon the included Animal, might be imputed to this, that upon the withdrawing of the Air, beſides the removal of what the Airs preſence contributes to life, the little Bubbles generated upon the abſence of the Air in the Bloud, juyces, and ſoft parts of the Body, may by their Vaſt number, and their conſpiring diſtenſion, variouſly ſtreighten in ſome places, and ſtretch in others, the Veſſels, eſpecially the ſmaller ones, that convey the Bloud and Nouriſhment; and ſo by choaking up ſome paſſages, and vitiating the figure of others, diſturb or hinder the due circulation of the Bloud? Not to mention the pains that ſuch diſtenſions may cauſe in ſome Nerves, and membranous parts, which by irritating ſome of them into Convulſions may haſten the death of Animals, and deſtroy them ſooner by occaſion of that irritation, than they would be deſtroyed by the bare abſence or loſs of what the Air is neceſſary to ſupply them with. And to ſhew, how this production of Bubbles reaches even to very minute parts of the Body, I ſhall add on this occaſion (hoping that I have not prevented my ſelf on any other,) what may ſeem ſomewhat ſtrange, what I once obſerved in a *Viper*, furiouſly tortured in our Exhauſted Receiver, namely that it had manifeſtly a conſpicuous Bubble moving to and fro in the wateriſh humour of one of its Eyes.

Another Digreſſive Experiment belonging to the ſame Title.

To ſhew, that not only the Bloud and Liquors, but alſo the other Soft parts, even in cold Animals, have Aerial particles latitant in them; we took the *Livers* and *Heart* of an *Eele*, as alſo the Head and Body of another fiſh of the ſame kind, cut aſunder croſſe wayes ſomewhat beneath the heart, and putting them into a Receiver, upon the withdrawing of the Air we perceived, that the Liver did manifeſtly ſwell every way, and that both the upper and lower parts did ſo likewiſe; and at the place where the diviſion had been made, there came out in each portion of the fiſh divers Bubbles, ſeveral of which ſeemed to come from the *Medulla Spinalis*, or the cavity of the Back-bone, or the adjoyning parts; and the External Air being let in, both the portions of the Eele preſently ſhrunk, ſome of the skin ſeeming to be grown empty or flaccid in each of them.

The

The XIV. Title.

Of the power of Aſſuefaction to enable Animals to hold out in Air, by Rarefaction made unfit for Reſpiration.

The power of Aſſuefaction *in other Caſes, made me think it very well worth trying what it would do in Reſpiration: And the rather, becauſe I preſumed, it might prove an Experiment of good uſe, if we ſhould diſcover, that by a gradual accuſtomance an Animal may be brought to live, either in a* much thinner *Air, or much longer in the* ſame *Air, than at firſt he could. But in regard that to make ſuch a Tryal perſpicuouſly enough, the opacity of the Bladder made uſe of in the former* Title, *was like to be an Impediment, I deviſed another way to obviate that Inconvenience, which may, I hope, be competently underſtood, by the heedfull peruſal of the following Tryals.*

Experiment 1.

We included in a round Violl with a wide neck, (the whole Glaſs being capable of containing about 8 ounces of Water) a young and ſmall *Mouſe*, and then tyed ſtrongly upon the upper part of the Glaſſes neck a fine thin bladder, out of which the Air had been carefully expreſſed, and then conveyed this Phantaſtical Veſſel into a middle ſized Receiver, in which we alſo placed a Mercurial *Gage* (adjuſted by our elſewhere mentioned ſtandard;) This done, the Air was by degrees pumped out, till it appeared by the Gage, that there remained but a fourth part in the *external* Receiver (as for diſtinctions ſake I call it;) whereupon the Air in the *internal* Receiver expanding it ſelf, appeared to have blown the Bladder almoſt half full, and the Mouſe ſeeming very ill at eaſe by his Leaping, and otherwiſe endeavouring to paſs out at the neck of his uneaſy Priſon; we did, for fear the over thin Air would diſpatch him, let the Air flow into the external Receiver, whereby the bladder being compreſſed and the Air in the Violl reduced to its former denſity, the little Animal quickly recovered.

Experiment 2.

A while after, without removing the bladder, the Experiment was repeated, and the Air by the help of the Gage was reduced to its former degree of Rarefaction, and the Mouſe, after ſome fruitleſs endeavours to get out of the Glaſs, was kept in that thin Air for full 4 minutes; at the end of which he appeared ſo ſick, that, to prevent his dying immediately, we removed the External, and took out the Internal Receiver. Whereupon, though he recovered, yet 'twas not without much difficulty, being unable to ſtand any longer upon his feet, and for a great while after continued manifeſtly trembling.

Experiment 3.

But having ſuffered him to reſt a reaſonable ſpace of time, preſuming that aſſuefaction had accuſtomed him to greater hardſhips, we conveyed him again into the external Receiver, and having brought the Air to the former degree of Expanſion, we were able to keep him there for a full quarter of an hour; though the external Receiver did not at all conſiderably leak; as appeared both by the Mercurial Gage, and by the continuing diſtenſion of the Bladder. And 'tis worth noting, That, till near the latter end of the quarter of an hour, not only the Animal did ſcarce at all appear diſtreſſed, remaining ſtill very quiet: but, which is more, whereas, when he was put in, the tremblings formerly mentioned were yet upon him and continued ſo for ſome time; yet afterwards, in ſpight of the Expanſion of the Air he was then in, they left him early enough And when the Internal Receiver was taken out, he did not only recover from his fainting fit ſooner then before; but eſcaped thoſe ſubſequent tremblings we have mentioned.

Experiment 4.

Incouraged by this ſucceſs, after we allowed him ſome time to recollect his ſtrength, we reconveyed him and the odd veſſel, wherein he was included, into the former Receiver, and pumped out the Air, till the Mercury in the Gage was not only drawn down as low as formerly; but near half an Inch lower, that there the Air might be yet further expanded, than hitherto it had been. And though this did at firſt ſeem to diſcompoſe our little Beaſt; yet after a while he grew very quiet, and continued ſo for a full quarter of an hour: when, being deſirous to try what operation a further Rarefaction of the Air would have upon him, we cauſed three Exſuctions more to be made by the Pump, before we diſcovered him to be in manifeſt danger, (at which time the Bladder appeared much fuller then before;) but then we were obliged to let the Air into the outward Receiver; whereupon the Mouſe was more ſpeedily revived then one would have ſuſpected.

And theſe tryals of the Power of Aſſuefaction ſeemed the more conſiderable, becauſe the Air, in which the Mouſe had all this while lived, had been clogged and infected with the excrementitious Effluviums of his Body; for 'twas the ſame all along, we having purpoſely forborn to take off the Bladder, whoſe regular Intumeſcencies and ſhrinkings ſufficiently manifeſted, that the veſſel, whereof 'twas a part, did not leak.

POSTSCRIPT.

Though the ſucceſs of the recited Experiments is very promiſing; yet a ſubſequent Tryal or two, whoſe particularities are ſlipt out of my memory, oblige me, in point of Candour, to declare, that, for further ſatisfaction, the Tryals of the power of Accuſtomance in reference to Air unfit for Reſpiration, ought to be both reiterated, and to be made in differing ſorts of Animals.

The XV. Title.

Some Experiments ſhewing, that Air, become unfit for Reſpiration, may retain its wonted preſſure.

Experiment 1.

We took a Mouſe of an ordinary ſize and having (not without ſome difficulty) conveyed him into an Ovall Glaſs, fitted with a ſomewhat long and conſiderably broad neck, which we had provided, that it might be wide enough to admit a Mouſe in ſpight of his ſtruggling. We conveyed in after him a Mercurial Gage, in which we had diligently obſerved and marked the Station of the Mercury, and which was ſo faſtned to a Wire reaching to the bottom of the Oval Glaſs, that the Gage, remaining in the neck, was not in danger to be broken by the motions of the Mouſe in the Oval part. The upper part of the long neck of the Glaſs was, notwithſtanding the wideneſs of it, hermetically ſealed by the help of a Lamp and a pair of Bellows, that we might be ſure, that the impriſoned Animal, ſhould breath no other Air, then that which filled the Receiver at the time when it was nipped up. This done, the Mouſe was watched from time to time, and though by reaſon of the largeneſs of the Veſſel in compariſon of ſo ſmall an Animal, he ſeemed to me rather drooping then very near death at the end of the ſecond hour; yet coming to look upon him about half an hour after, he was judged by the Spectators quite dead, notwithſtanding our ſhaking of the Veſſel to rouze him up. This made me caſt my eyes upon the Gage, wherein I could not perceive any ſenſible change of the Mercuries Station. But being unwilling to give over the Mouſe without trying what freſh Air would do to recover him, I cauſed the ſealed part of the Glaſs to be broken off, and, notwithſtanding that his continuing to appear dead increaſed the confidence of thoſe that thought him ſo, I obtained after a while ſome faint tokens of Life; though I am not ſure, that they would have continued in a Veſſel where the Air was ſo clogged and infected, if it had not been that freſh Air was frequently blown in by a pair of Bellows, whoſe noſe was inſerred into the neck of the Glaſs. This freſh Air ſeemed evidently, though but ſlowly, to revive the gaſping Animal, whom I would not, nor could not conveniently take out of the Glaſs, till he had gained ſtrength enough to make uſe of his Leggs; after which without breaking of the Glaſs (which I was loath to looſe, having then no other of the kind) we took him out and found him quickly able to go up and down. After which ſervice, and another Tryal we had made with him, which belongs not to this place, we ſet him at liberty to ſhift for himſelf.

Experiment 2.

Such an Experiment as the former we made with like ſucceſs upon a ſmall Bird included *with a Gage* in a Receiver holding about a quart of Water. The Bird in about half an hour appeared to be ſick and drooping, and the faintneſs and difficulty of breathing increaſed for about two hours and an half after that, at which time the Animal dyed, the Gage being not ſenſibly altered unleſs perhaps the Mercury appeared to be impelled up a little thought higher than it was when put in; which yet might well enough proceed from ſome accidental cauſe.

Experiment 3.

To ſatisfie ſome curious perſons; that it is not *want* of *Coldneſs*, but ſomething elſe in the included Air, that makes it deſtroy the Birds that are pent up in it, and by the hot Exhalations that ſteam from their bodies may be ſuppoſed to overwarm it, we made the following Experiment.

In a Glaſs-Viol, capacious enough to hold about 3 quarts of water, we not only included, but for greater accuracy hermetically ſealed up a ſmall Bird, and found, that in a few minutes he began to be ſick and pant; which Symptoms I ſuffered to continue and encreaſe againſt the mind of a learned byſtander, (who thought the Animal would not hold out ſo long,) till they had laſted juſt half an hour: at which time having provided a veſſel of water with *Sal Armoniack* newly put into it, to refrigerat it, (according to the way I elſewhere publiſhed;) and the liquor thus made exceeding cold, ſomewhat to the wonder of thoſe that felt it; the Viol with the ſick Bird was immerſed in it and kept there in that condition for 6 minutes; and yet it did not appear, in the judgment o

th

the By-ſtanders, that the great refrigeration; that muſt be this way procured to the impriſoned Air, did ſenſibly revive or refreſh the drooping Animal, who manifeſtly continued to pant exceedingly as before; and, as ſome affirmed, more; So that this remedy proving ineffectual, the viol was removed out of the water, and the Bird ſometime after did, as I foretold, make many ſtrains to Vomit (though ſhe brought up little) followed by Evacuations downward, before ſhe quite expired, which ſhe did within a minute or two of a juſt hour, after the beginning of her impriſonment.

If I had been able (which I was not) to procure more Birds, I would willingly have proſecuted this Experiment by ſeveral other not unhopefull tryals; which for want of Subjects I was fain to leave only deſigned.

The XVI. Title.

Of the uſe of the Air to elevate the Steams of Bodies.

In the Digreſſion about Reſpiration annext to the 41th of our *Phyſico-mechanical* Experiments formerly publiſhed, it is propoſed as one of the conſiderable uſes of the Air in Reſpiration, that, being drawn into the Lungs, it ſerves to carry off with it, when 'tis breathed out again, the Recrementitious ſteams that are ſeparated from the maſs of Blood in its Paſſage through the Lungs: from which fuliginous Excrements if the Blood were not continually freed by the help of the Air, after nature had been accuſtomed to that way of diſcharging them, their ſtay in the body might have very great and deſtructive Operations on it.

For the Illuſtration of this uſe of the Air, I ſhall now ſubjoyne the following Experiment.

We made by diſtillation a blood-red Liquor, which chiefly conſiſted of ſuch Saline and Spirituous particles, as may be obtained from the Maſs of Blood in humane Bodies; This Liquor is of ſuch a Nature, that if a Glaſs Viol, about half filled with it, be kept well ſtop'd, the red liquor will reſt as quietly as any ordinary one, without ſending up any ſmoak or viſible Exhalation; But if the Viol be unſtopped ſo, that the external Air be permitted to come in, and touch the Surface of the Liquor, within a quarter of a minute or leſs, there will, upon this Contact, be elevated a copious white ſmoak, which will not only fill the upper part of the Glaſs, but plentifully paſs out into the open Air, till the Viol be again ſtopped.

My purpoſe in this Tract to forbeare ſidings in Controverſies, keeps me from taking notice of the ſpeculations ſuggeſted by ſome of the Phœnomena of this Liquor; which yet I thought I might lawfully mention, as far as I have done it, becauſe it but adventures upon giving one of the Uſes rather of the Air, then immediately of Reſpiration it ſelf; and is brought but to illuſtrate what I have not found denied by any, though conſidered by very few; namely, the office of the Air to carry off in Expiration the fuliginous ſteams of the Lungs. For, in our Experiment we manifeſtly ſee, that the very Contact of the Air may give the Corpuſcles of moiſt bodies a peculiar Volatility,or facility to emerge in the form of Steams.I know,there are ſome Corroſive Spirits,as in Nitre and Salt,ſimple, or compounded of them, that,when they are very ſtrong, emit for a while manifeſt fumes ; but the difference of thoſe Liquors, and their inferiority to our red Spirit,in the Capacity of ſmoaking Liquors,might eaſily enough be manifeſted,if it were judged proper in this place,where it may ſuffice,to take notice of theſe two things : The *one* is,That when the Viol has lain ſtopped and quiet a competent time, the upper half of it will appear deſtitute of fumes,of which the Air, it ſeems, will imbibe,and conſtantly retain *but* a certain moderate quantity,which may give ſome light towards the Reaſon, Why the ſame Air,which will be quite clogged with ſteams,will not long ſerve for Reſpiration, which requires frequent ſupplies of freſh Air : The *other* is,That if the unſtop'd Viol were placed in our *Vacuum*,it would not emit any viſible ſteams at all,nor ſo much as to appear in the upper part of the Glaſs it ſelf that held the Liquor ; whereas,when the Air was by degrees reſtored at the ſtopcock,without moving the Receiver it ſelf,to avoid injuring its cloſeneſs, the returning Air would preſently raiſe the fumes, firſt into the vacant part of the Viol,whence they would aſcend into the Capacity of the Receiver ; and likewiſe,when the Air,that was requiſite to ſupport them,was pumped out,they alſo accompanied it,as their unpleaſant ſmell evinced,and the red Spirit,though it remained unſtopped, emitted no more fumes till the new Air was let in.

periment is related of it,that has ſomething in common with *this* , and may ſo far ſerve to confirm what is now delivered ; as this alſo has ſome things additional to *that*: Beſides that that Liquor being made with Ingredients Corroſive,and of a bad name among Chymiſts themſelves, the fumes,that proceed from it,may fright many from daring to meddle with it : whereas this our red Spirit has been found potently medicinal for ſome diſtempers of the Lungs by a Dr. *of Phyſick*, whom I deſired to try it. The other Phœnomena of this Liquor I ſhall not ſtay to deſcribe as not belonging to this place, and the Liquor it ſelf with very little variation I have in the *Hiſtory of Colours* communicated.

The XVII. Title.

Of the long continuance of a Slow-worm *and a* Leech *alive in the Vacuum made by our Engin.*

In the often cited digreſſion about Reſpiration,there is mention made of the great Vivaciouſneſs of *Houſe-Snails* as they call them , and how little operation the withdrawing of the Air had upon them in compariſon of what 'tis wont to have on other Animals. I ſhall now add by way of Confirmation,that I made Tryal upon ordinary *white Snails without ſhells*,whereof two of differing ſizes (the biggeſt about an Inch and a half, and the other about an Inch in length) were included in a ſmall portable Receiver,which being carefully exhauſted, and ſecured againſt the Return of the Air, was attentively conſidered by me, preſently after 'twas removed from the Engine; whereby it was eaſy to diſcern, that both the Snails thruſt out and retracted their Horns (as they are commonly called) at pleaſure, though their Bodies had in the ſofter places pretty ſtore of newly generated Bubbles ſticking to them: but though they did not looſe their motion near ſo ſoon, as other Animals were in our *Vacuum* wont to do; yet coming to look on them after ſome hours, they appeared moveleſs and very tumid, and at the end of 12 hours the inward parts of their bodies ſeemed to be almoſt vaniſhed, and they ſeemed to be but a couple of ſmall full-blown Bladders; and on the letting in of the Air they immediately ſo ſhrunk, as if the Bladders having been prick'd, the receding Air had left behind it nothing but skins; nor did either of the Snails afterwards, though kept many hours, give any ſigns of life.

Upon a ſuppoſition that the cold, and clammy Conſtitution of Snails might be a main cauſe of their being able to endure the abſence of the Air ſo well, I thought it worth Tryal, whether *Efts* and *Leeches* might not yet be more able to continue in our Vacuum then a Snail; and accordingly ſome Experiments were made perſuant to that Curioſity; the moſt fully regiſtred whereof are theſe that follow.

Experiment 1.

We included in a Receiver, whoſe Globular part was about the bigneſs of a large Orange, one of that ſort of Animals, that they vulgarly call *Efts*: having withdrawn, but not ſollicitouſly, the Air, and ſecured the veſſel againſt the unpermitted return of it, we kept him there about 48 hours, during all which time he continued alive, but appeared ſomewhat ſwelled in his belly; his under-chap moving the very firſt night, but not the day and night following. By opening the Receiver at length under water, we perceived, that about half the Air had been drawn out. As ſoon as the water was impelled into the Glaſs, the Animal, that was before dull and torpid, ſeemed, by very nimble and extravagant motions, to be ſtrangely revived.

Experiment 2.

We took a *Leech*, that was of a moderate bigneſs, or ſomewhat ſhort of it, and having included it together with ſome water in a portable Receiver, that was gueſſed to be capable of holding about 10 or 12 ounces of that liquor; the Air was pumped out after the uſual manner, and the Receiver being removed to a lightſome place, we obſerved, as we expected, that, the Leech keeping her ſelf under water, there emerged from divers parts of her Body ſtore of Bubbles, ſome of them in a diſperſed way, but others in Rows or Files, if I may ſo ſpeak, that ſeemed to come from determinate points. Though this Production of Bubbles laſted a pretty while, yet the Leech did not ſeem to be very much diſcompoſed by her preſent condition. This done we diſpoſed of the Receiver, which was well ſecured from the ingreſs of the outward Air, into a quiet place, where we daily viſited it once at leaſt, or oftner, as there was occaſion;

and found the Leech ſomewhat faſtened by her tail to that part of the Glaſs that was under water, and ſometimes wandring about that part, which was quite above water; and ſtill, when we endeavoured to excite her, ſhe quickly manifeſted her ſelf to be alive: And indeed (which will be thought ſtrange) appeared ſo lively after the full expiration of five natural days, that expecting ſomething might have happened to the Receiver, and thereupon reſolving to try how ſtanch it had continued, I opened it under water, by which means the outward Air impelled in ſo much of that Liquor, that I was ſatisfied, the Receiver was immediately before as well exhauſted, as others are wont to be in our Pneumatical Experiments.

The XVIII. Title.

Of what happened to ſome Creeping *Inſects in our* Vacuum.

Notwithſtanding the great Variety of Reptills, that Nature does almoſt every where produce; yet the inconvenient time and place, wherein the following Tryals were made, ſupplyed me with ſo few, that about theſe Animals I find among my Adverſaria no more then the enſuing Notes.

Experiment 1.

We took five or ſix *Caterpillars* of the ſame ſort; but I could not tell to what ultimate ſpecies the Writers about Inſects referred them. Theſe being put into a ſeparable Receiver of a moderate ſize, had the Air drawn away from them, and carefully kept from returning. But notwithſtanding this deprivation of Air, I found them, about an hour after, moving to and fro in the Receiver; and even above two hours after that, I could by ſhaking the Veſſel, excite in them ſome motions, that I did not ſuſpect to be Convulſive. But looking upon them again ſome time before I was to go to bed (which may be was about 10 hours after they were firſt included) they ſeemed to be quite dead, and, though the Air were forthwith reſtored to them, they continued to appear ſo, till I went to Bed; yet, for Reaſons elſewhere expreſſed, I thought fit to try, whether time might not at length recover them, and leaving them all night in the Receiver, I found the next day, that 3, if not 4 of them, were perfectly alive.

Experiment 2.

We took from an hedge a branch, that had a large Cobwebb of Caterpillars in it, and having divided it into two parts, we put them into like Receivers, and in one of them ſhut up the Caterpillars together with the Air, which from the other was exhauſted. The event was, That in that which had the Air, the little and difficultly viſible Inſects, after a ſmall time, appeared to move up and down as before, and ſo continued to do for a day or two; after which, other occaſions made the Experiment to be neglected: whereas that Glaſs whence the Air had been drawn out, and continued kept out, ſhewed after a very little while no motion that we could perceive. But to try, Whether Caterpillars may continue ſo far alive in our *Vacuum* all the winter, as the next Spring

or

or Summer to proceed in the tranſmigration to a Butterfly, is a Tryal that we have but begun, and therefore muſt not pretend to ſay any thing about its Event.

The XIX. Title.

Of the Phænomena ſuggeſted by Winged Inſects *in our Vacuum.*

When our Phyſico-mechanical Experiments were diſpatched to the Preſs, the inconvenient ſeaſon of the year, and the difficulty of making the Receivers, I then employed, to keep out the Air for any long time, hindered me from then publiſhing above a Tryal or two of what would happen to *Winged Inſects* in our Vacuum. But afterwards being provided of more commodious Veſſells, I thought fit at ſeveral times to repair that Omiſſion by various Attempts, where of the chief enſue.

Experiment 1.

Novemb. 12th *about* 8 *a Clock at night.*

There were taken 4 middle-ſiz'd *Fleſh-flies*, which having their heads cut off were incloſed in a Portable Receiver, furniſhed with a pretty large Pipe and a Bubble at the end. As ſoon as the Receiver was Exhauſted, thoſe Flies loſt their motion (which was not brisk before;) an hour or two after, I approached them to the fire, which reſtored not their Motion to them (but as to one of them I ſuſpected it had a Languid motion for a while;) wherefore I let in the Air upon them, after which in a very ſhort time (though not immediately) they began one after another to move their Leggs, and one or two of them to walk; and having kept them all night in a warm place, when I ſent one the next morning to try, if they would manifeſt any motion, he told me, that for a while they did, though, when I afterward riſe my ſelf, I could not perceive any motion in them.

Experiment 2.

Sept. 11th.

About Noon we cloſed up divers *ordinary Flies*, and a *Bee* or *Waſp*; all which, when the Air was fully withdrawn, lay as dead, ſave that for a very few minutes ſome of them had Convulſive motions in their Leggs. They continued in this ſtate 48 hours, after which the Air was let in upon them, and *that* not producing any ſigns of Life in them, they were laid in the Meridian Sun, but not any of them ſeem'd in any degree to recover.

Experiment 3.

Dec. the 11th.

We put a great *Fleſh-fly* into a very ſmall portable Receiver, where at firſt it appeared to be very brisk and lively, but as ſoon as the Air was drawn out, fell on his back and ſeemed to have Convulſive motions in her feet and *Proboſcis*; from whence ſhe preſently recover'd upon the letting in of the Air; which being drawn out again, ſhe lay as dead: but a while after, (within a quarter, or half an hour) I perceived, that upon ſhaking the Receiver, ſhe ſtirred up and down, (but faintly.) This was done pretty late yeſter-night, ſince whence I had not occaſion to look on the Glaſs, till this night after Supper, when I found the fly not (whileſt I ſtayed to endeavour it) to be recovered either by warmth, or letting in the Air. A while after this Note was written, this Fly recovered; and being next morning ſealed up again in that Glaſs, and kept 48 hours, though over the Chimney, died for good and all.

Experiment 4.

We took a large *Graſs-hopper*, whoſe Body, beſides the Horns and Limbs, was about an Inch in length, and of a great thickneſs in Proportion to that length: this we conveyed into a Portable Receiver of an Oval form, and capable of holding (by our gueſs) about a Pint of water and more, and having afterwards pumped out the Air, till by the Gage it appeared to have been pretty well drawn out, we took care, no Air ſhould reenter to diſturb the Experiment. The ſucceſs whereof was this: Firſt, Though, before the Exhauſtion of the Air was begun, the Graſhopper was ſtirring, and lively, and continued ſo for a while after the beginning of the Operation; yet when the Air began to be conſiderably rarified, he appeared to be very ill at eaſe, and ſeemed to ſweat out of the Abdomen many little drops of Liquor, which being united trickled down the Glaſs like a little ſtream, which made at the Bottom a ſmall Pool of clear Liquor, amounting to near a quarter of a Spoonful, and by that time the Receiver was ready to be taken off, the Graſhopper was fallen upon his back, and lay as dead. Secondly, Though having a little after laid the Glaſs in a South window, on which the Sun then ſhone, I perceived ſome ſlow motions in the Thorax, as if he ſtrained to fetch breath; yet I was not ſure they were not Convulſive motions, and what ever they were, they laſted but a while, and then the Animal appeared to be quite dead, and to continue ſo for three hours from the removal of the Receiver. Thirdly, that time being expired, the Glaſs was opened and the Air let in upon him, notwithſtanding which there appeared no ſign at all of Life; but imagining there might be ſome time requiſite to recover him out of ſo deep a ſwoon, I let the Glaſs reſt in a convenient Poſture, that the water that came from him might not endanger him, for a quarter or half an hour, and though I then perceived no ſigns of Life, yet being deſirous to perſue the Tryal yet further, I cauſed him to be carried into a Sunſhiny place, where the Beams of a declining Sun preſently began to make him ſtir his Limbs, and in a ſhort time brought him perfectly to Life again.

Experiment 5.

We took one of thoſe *ſhining Beetles* they call *Roſe-Flies*, and having included it in a very ſmall round Receiver, which we exhauſted, and though he that attended the Engine, affirmed, *April the* 15th. it ſtrugled much whileſt the Air was withdrawing, yet preſently after, I could perceive but little motion (and part of that ſeemed almoſt Convulſive) and afterward going abroad, and not returning to look on the Glaſs till about 6 hours after, the Fly ſeemed quite dead, and diſcovered not any motion upon that of the Glaſs. And within about an hour after, though I let the Air ruſh in; yet no ſign of Life enſued, neither immediately, nor for a pretty while after. So that ſuſpecting the fly to be really dead, and yet not reſolutely concluding it, though I would then wait no longer, yet three or four hours after (*viz.* about 10 of the Clock at night) I returned to the Receiver, and found the *Beetle* lively enough. Whereupon I cauſed the Glaſs to be again exhauſted, and ſecured from the Ingreſs of the Air, during which time the Animal ſeemed to be much diſquieted by what was done to it, but did not looſe its motion before I went to bed, which was ſoon after.

Experiment 6.

About *Butterflies* I remember I made ſeveral Tryals, moſt of which chanced to be loſt; but thus much I very well remember, that having obſerved them not only to live but to move longer then was expected, I choſe to include divers of them in Receivers ſomewhat large, eſpecially that I might ſee, whether in ſo thin a Medium ſome or other of them, by the help of their large wings, would be able to fly. But though, whileſt the Air continued in the Glaſſes, they flew actively as well as freely up and down; and though after the Exhauſtion of the Air, they continued to live and were not moveleſs; nay though at the bottom of the Receiver they would even move their wings and a little flutter, yet I could not perceive any of them to fly, by which I mean, perform any progreſſive motion ſupported by the Medium only. And by frequently inverting the Receiver (which I took care ſhould be pretty long to let them fall from one extream to the other,) they would fall like dead Animals without diſplaying their wings, though juſt as they came to touch the Bottom, ſome of them would ſometimes ſeem to make ſome uſe of them, but not enough to ſuſtain themſelves, or to keep their falls from being rude enough.

The XX. Title.

Of the neceſſity of Air to the motion of ſuch ſmall Creatures, as Ants *and even* Mites *themſelves.*

In the Experiments hitherto mentioned, the Animals, on which the Tryals have been made, were divers of them of a moderate Bulk; and others of them, though ſmall, yet not of the leaſt ſizes that Nature afforded us. Wherefore I thought fit to annex the following Experiments, wherein I deſigned to examine, Whether even thoſe minute ſorts of Animals, whoſe bulk is thought the moſt contemptible, have not, as well as the greater, need of the Air, if not to make them live, yet at leaſt to enable them to move.

A pretty number of *Ants* were included in a ſmall Portable Receiver exhauſted yeſterday about noon: Between 6 and 7 in the Afternoon they ſeemed to be all quite dead, and the rather, becauſe, though they were very lively juſt before they were ſealed up, running briſkly up and down the Bubble they were in; yet they grew almoſt moveleſs as ſoon as the Air was exhauſted; and a little while after appeared more ſo: though I then ſuſpected more then I ſince did, that they were much inconvenienced by ſome ſmall glutinous ſubſtance that ſeemed to have got into the ſmall Receiver from the Vapours of the Cement. When I looked on them at the the time lately mentioned, I opened the Glaſs, whereupon the Air ruſhed in; but no ſign of Life appeared for a great while in any of the *Ants*: but looking upon them this morning about 9 a Clock, I found many of them alive and moving to and fro.

It is ſaid by Naturaliſts upon the Authority of Ariſtotle, *that the Animal, the* Greeks *call ἄκαρι, is the minuteſt of Living Creatures. But thoſe of this ſort being very hard, if at all, to be met with here, I thought fit to make ſome Experiments upon the leaſt of the Terreſtrial Animals I could procure, and try, whether or no* Mites *themſelves, which are reputed but* Living Points, *and not to be taken notice of by the naked Eye to be living, but by motions which even an attentive one can ſcarce diſcover, ſtand in need of the Air; eſpecially becauſe, in caſe they do, it may ſuggeſt to us ſome odd Reflections upon the ſtrange ſubtlety and minuteneſs of the Aerial particles, which muſt be capable of flowing in and paſſing out at the inviſible and almoſt in-imaginable ſmall pores and other cavities of the parts of an Animal, whoſe entire body is reputed but a* Phyſical *point.*

We conveyed then a pretty number of *Mites*, together with the mouldy Cheeſe, they were bred in to nouriſh them, into 3 or 4 Portable Receivers (which were all of them very ſmall,) not much differing in ſize. From all of theſe, ſave one, we withdrew the Air; and then, making uſe of our peculiar contrivance to hinder its return, we took them one after another from the Engin, and laid them by, for further obſervation. That *one*, which I took notice that we had reſerved, and in which, to obſerve the difference, we thought fit to leave the Air, was ſealed at a Lamp-furnace after the uſual manner of nipping up Glaſſes there. This done, there remained nothing but to obſerve the Event of our Tryals, which afforded us the enſuing *Phænomena*;

1. Thoſe Mites, that were incloſed in the ſmall Glaſs that never came near the Engin, continued alive and able to walk up and down for above a full week, after they had been put in, and poſſibly would have continued much longer, if the Glaſs had not been accidentally broken.

2. As ſoon as ever one of the Receivers was removed from the Engin, I looked with great attention upon it; and though juſt before the withdrawing of the Air the *Mites* were ſeen to move up and down in it; yet within a few minutes after the Receiver was applyed to the Engin, I could diſcern in them no Life at all, nor was any perceived by ſome younger Eyes then mine, whereunto I expoſed them. Nay by the help of a double Convex-glaſs (that was ſo ſet in a frame as to ſerve me as a Microſcope on ſuch occaſions) I was not able to ſee any of them ſtir up and down. Nor was any motion taken notice of in the other ſmall Receiver of like bigneſs and ſhape with mine, by them that had exhauſted it of Air. And my occaſions not permitting me to attend the obſervation any longer in the place where 'twas made, I took the Receiver, I had ſo attentively conſider'd my ſelf, along with me in the Coach, and having occaſion to make ſome ſtay about an hour after, I looked upon it attentively again, but could not perceive any of the *Mites* to ſtirr; and the like unſucceſsfull obſervation I made when I had a conveniency 2

or 3 hours after that. And the place I did it in being one, where I thought my ſelf as it were at home, I firſt let in the Air, to try if the Mites were not quite dead, and though neither upon its ruſhing in, nor during my ſtay there, I could perceive any of them to ſtir; yet I left the Receiver unſtopt as it was in the Window, upon a ſuſpition that the Air might not be able to produce its operation upon them in a ſhort time.

3. And therefore paſſing by the ſame place about 2. or 3 dayes after, I called in to look upon my Receiver, and found a number of my little Animals revived, as an attentive Eye might eaſily perceive by the motion of certain little white ſpecks, when it was helped to obſerve it by little marks, I made on the outſide of the Glaſs (which was purpoſely choſen thinn and clear) near this or that Mite, with a Diamond; by the approach to, or Receſs from which Marks, the progreſſive motion became (perhaps within a minute) plainly diſcoverable, eſpecially if we uſed the following Expedient, (which I found the beſt of thoſe I try'd,) namely, That, when the Eye perceived little white ſpecks that looked like Mites, the Receiver ſhould be ſo turned and returned, that the bellies and feet of thoſe little Creatures were uppermoſt, notwithſtanding which they would not eaſily drop down, but continue their motion; which ſpecks being made upon the Concave ſurface of the thin Glaſs it ſelf (to which you may approach your Eye as much as you pleaſe) are thereby rendred much more eaſily viſible. But, this being only intimated upon the By, I proceed to take notice, that in the newly mentioned Receiver the Mites did, by ſtirring up and down, continue to appear alive for 2 or 3 dayes after, if not longer. I ſhould not, I confeſs, have thought it ridiculous to ſuſpect, that the Mites, which at firſt loſt their motion, did at laſt really dye, and that thoſe, I after ſaw ſtirring up and down, were others newly generated in the included mouldy Cheeſe: But I was not apt to think this ſuſpicion probable; not only becauſe of the extream difficulty of making any living Creature to be generated in *Vacuo Boyliano*, but becauſe it did not ſeem agreeable to what I elſewhere noted about the way and time of the Propagation of Mites, whoſe Eggs I have divers times obſerved with pleaſure, that at a ſeaſon of the year, that was not favourable (for theſe things happened in a cold *March*,) newly generated Mites ſhould in 2 or 3 dayes grow up to their juſt bigneſs, which ſeveral of thoſe, we obſerved, ſeemed to have attained.

4. But becauſe it doth not by the third *Phænomenon* appear, Whether or no, in caſe our Mites had been kept in a moveleſs ſtate for a much conſiderabler time then 3 or 4 hours, they would have been recoverable by the admiſſion of the Air; I ſhall add, to ſatisfy that doubt, That one of the Portable Receivers above-mentioned, being exhauſted and carefully ſecured from the regreſs of the Air, was kept from Munday morning to Thurſday morning: after all which time, our attentive Eyes being unable to diſcover any ſigns of Life among the included Mites, the Air was let in upon them, and, after no long time, had ſuch an operation upon them, that both I and others could plainly ſee them creep up and down in the Glaſſes again.

An Accompt of Two Books.

I. *TRACTS written by the Honourable* ROBERT BOYLE, *about the* COSMICAL *Qualities of things; the Temperature of the* SUB-TERRANEAL *and* SUB-MARINE *Regions; and the* BOTTOM *of the Sea; together with an Introduction to the* HISTORY *of* PARTICULAR *Qualities.* Oxford, 1670. *in* 8°.

THe main Deſign of the Noble Author in theſe as well as his other Phyſical writings, is, to provide ſtill more and more Materials for the Hiſtory of Nature. He prefixes to theſe Tracts an Introduction to the *Hiſtory of particular Qualities*, after he hath already given us an Excellent Account both of the Nature, and of the Origine of Qualities in *general*. And intending now, to proceed to Qualities in *particular*, and to conſider, How far the manner whereby they are produced, and thoſe other Phœnomena of them, that may upon occaſion be taken notice of, will accord with, and, by doing ſo, confirm the Doctrine hitherto propoſed by him; and whether they will not (at leaſt) much better comport with *That*, than the Opinions either of the *Peripateticks*, or the *Chymiſts*

But before he deſcends to mention any of theſe Particular Qualities, he thinks it worth while to conſider ſome Scruples about the *Corpuſcularian* Doctrine touching Qualities, which unleſs they be removed, may not a little prejudice the reception of a good part of what he purpoſes to deliver about particular Qualities.

Of theſe difficulties he inſiſts chiefly upon that Grand one, which imports, that 'tis incredible, that ſo great a Variety of Qualities, as we actually find to be in Natural Bodies, ſhould ſpring from Principles ſo

And

ons of Matter are manifeſtly deducible from *Local Motion*; but alſo, that theſe Principles, being variouſly aſſociated, are ſo fruitfull, that a Vaſt number of Qualities, and other *Phœnomena* of Nature may reſult from them.

In the Tract of the *Syſtematical* or *Coſmical Qualities*, he maketh it out, That in eſtimating the Qualities of Natural Bodies, we are not only to conſider the power, any particular one hath of acting upon, or the capacity it hath of ſuffering from ſuch and ſuch particular Bodies; but alſo that there may be ſome Attributes, which may belong to this or that Body, and divers alterations, to which it may be lyable upon the account of a Syſteme ſo conſtituted as our World is; whoſe Fabrick is ſuch, that there may be divers unheeded Agents, which, by unperceived means, may have great operations upon the Body we conſider, and work ſuch changes in it, and enable it to work ſuch changes on other Bodies, as are rather to be aſcribed to ſome un-obſerved Agents, than to thoſe other Bodies, with which the Body propoſed is taken notice to have to do.

To this is ſubjoyned an *Appendix* touching *Coſmical Suſpicions*. For, the Author conſidering, that the World is a Subject ſo vaſt, that not only all demonſtrable Truths, which may be diſcovered concerning it, may be look't upon as important, but even *Conjectures* and *Suppoſitions* themſelves that relate to it in general, may deſerve not to be altogether paſſed by in ſilence; He adventureth to entertain the Reader with ſome Thoughts of this nature, [illegible] alledge in their favour ſome Hiſtorical Obſervations

picable.

In the Three remaining Tracts, the Author

Firſt, treats of the *Temperature* of *Subterraneal Regions* and of the Air reaching thither; compriſing the ſum of what he hath to propound, in four Propoſitions; *viz.* That the firſt Region of the Earth is very variable both as to Bounds, and as to Temperature: That the ſecond Region ſeems to be for the moſt part cold in compariſon of the other two: That in ſeveral places, which, by reaſon of their diſtance from the Surface of the Earth one would refer to the Middle Region of it, the Temperature of the Air is very differing at the ſame times of the Year: That the third Region of the Earth hath been obſerved to be conſtantly and ſenſibly warm, but not uniformly ſo; being in ſome places conſiderably hot.

Secondly, of the *Temperature* of the *Submarine Regions* as to Heat and Cold: Where, aſſigning to the *Sea* no more than two Regions; the *one*, from the ſuperficies ſo far downwards as the manifeſt operation of the Beams of the Sun, or other Cauſes of warmth do penetrate; the *other*, from thence to the bottom of the Sea: He obſerveth, that, according to that diviſion the Limits of the upper Region will not be alwaies conſtant in all Climats, in all Seaſons, and in all Weathers. And as to the Temperature of the Lower Region, he taketh notice, that that is generally Cold, ſome few places excepted: Confirming all by conſiderable relations, he procured from Sober and Creditable Navigators, and other Perſons, practiſed in Diving, both with and without Engins.

Thirdly, Of the *Bottom of the Sea*; concerning which he hath enquired *firſt*, after the Inequality of the Soil there, obſerved to be very gradual and abrupt: *Next*, after the great preſſure of the water there againſt other Bodies: *Laſtly*, after the Tranquillity of the water there, whether it be conſiderably diſtant from the Surface.

II. *CATALOGUS PLANTARUM ANGLIÆ & INSULARUM adjacentium: tum Indigenas, tum in agris paſſim cultas complectens. Operâ* Johannis Raji *M. A. & Soc. Regiæ Sodalis.* Londini, *Impenſis* J. Martyn. 1670. *in* 12°.

The Ingenious and Induſtrious Author of this Book, having ſome years ago publiſht a Catalogue of the Plants growing about *Cambridge*, hath now obliged his Country, by preſenting it with a Catalogue of the Plants of all *England*, and of the Iſles adjacent. In the doing of which, he hath ſpared neither pains nor coſt, travelling himſelf through all the conſiderable parts of this Kingdom, and ſo viewing and gathering himſelf almoſt all the Plants here deſcribed, ſome few excepted, which he ſaith he hath either taken out of the beſt Authors, or received from very creditable and skilfull Friends. Neither hath he been contented to ſearch and gather them himſelf, but alſo diligently compared them with their Hiſtories and Figures found by *Botaniſts*; deſcribing thoſe, which ſeemed to have been omitted by others, and adding, with their Characterical notes, thoſe that had been confuſedly and careleſly delivered before. A work exceeding uſeful, eſpecially in order to the compoſing a General Hiſtory of Plants, wherein they are to be diſtributed into their ſeveral Families, according to their ſpecifical Differences, (a thing ſo neceſſary to learn them more eaſily, to underſtand them more clearly, and to remember them more laſtingly,) which Diſtribution cannot be made without an accurate and a compleat *Enumeration* and *Deſcription* of the ſeveral Kinds of Plants, growing up and down in the ſeveral parts of the World.

The Reader will find in this *Catalogue*, beſides the moſt neceſſary *Synonyma* of the Plants here enumerated, a ſummary Deſcription alſo of their principal Vertues; enterlaced with the mention of many new Obſervations and Experiments, Medical and Phyſiological. And that, which exceedingly raiſeth the value and endeareth the welcome of this Book, is, That the Author in the *Preface* thereof very obligingly promiſeth a *General Method of all Plants*, together with the differing Characters of their kinds and families, to be publiſhed by him in a ſhort time, and withall (to him poſſible) accurateneſs

---

London, Printed for *John Martyn*, Printer to the *Royal Society*, at the *Bell*
in St. *Pauls Church-yard*, 1670.

Numb. 64.

PHILOSOPHICAL TRANSACTIONS.

October 10. 1670.

The CONTENTS.

An Extract of a Letter, written by M. Hevelius, *containing a late Obſervation of the* Variation *of the* Magnetick Needle; *together with an Account of ſome other Curioſities found in* Boruſſia. *A Letter of M.* Childrey, *animadverting on the Hypotheſis of Dr.* Wallis *about the* Tydes. *An Anſwer of Dr.* Wallis *to thoſe Animadverſions. An Accompt of Four Books*: I. *DISSERTATIONES MEDICÆ TRES; De Cauſis Fluxus Menſtrui Mulierum; De Sympathia Variarum Corporis partium cum Utero; De Uſu Lactis ad Tabidos reficiendos, & de Immediato Corporis Alimento;* Auth. Franc. Bayle, *M. D.* II. *HISTORIÆ GENERALIS INSECTORUM* Johannis Swammerdami, *Pars prima.* III. *The CREED of* M. *HOBBES, Examined by M.* Teniſon. IV. *FRANCISCI JOSEPHI BURRHI Epiſtolæ duæ ad* Thom. Bartholinum.

An Extract of a Letter, written by Monſieur Hevelius *to the Publiſher, from* Dantzick, *July* 5. 1670. *Containing chiefly a late Obſervation of the Variation of the* Magnetick Needle; *together with an Account of ſome other Curioſities in thoſe Parts:* Engliſhed, *as follows;*

WOuld to God, that thoſe Excellent Books that are publiſh't in *Engliſh*, were, for the benefit of the whole Learned World, made Latin; All Learned men would be exceedingly obliged to you for it. I am perſwaded, Sir, you will do your part in taking care, that ſo uſeful and ſo neceſſary a work may not be leſt undone.

Lately, on the 22*th*. of *June* (ſt. n.) about the time of the Solſtice, I was ſearching after the preſent *Declination* of the *Magnet*, which 28 years ago (vid. A. 1642.) I had likewiſe obſerved here with great care; as about the ſame time at *Konigsberg* Monſieur *Linnemannus*, the then Profeſſor of the Mathematicks there, had obſerved alſo. We both found the Magnetick Needle at that time to decline from the *North* 3 *d* 5′. *Weſt-ward.* But now it is far otherwiſe; for it declines at preſent, as I have very carefully obſerved, 7 *d.* 20′. to the ſame Quarter; ſo that in the ſpace of twenty eight years, that declination is increaſed 4 *d.* 15′. In the year 1628, if I remember aright, I found it near 1 degree *Weſtward:* Which declination was affirmed by the Learned *Petrus Crugerus* (once my worthy Præceptor) to have been, about the beginning of this Age, or the end of the next foregoing, 8 *d*. 30′. *Eaſt-ward*; the ſame *Crugerus* alſo making uſe of that Oriental Declination in deſcribing all his Dyals, as may be ſeen in the Tract he hath written of the ſame; though it be not certainly known, by whom, and in what year that Obſervation was made.

Further, It appears by our more recent Obſervations, that this Declination of the Load-ſtone doth here, at *Dantzick*, almoſt every ſeventh year, or, to ſpeak more preciſely, every ſix year and ſeven months, increaſe to one whole degree, and ſo each year, to 9′. 6″. Which is ſufficiently confirmed by the Obſervations made at *Lime-houſe* near *London*, by thoſe three famous Engliſh men, *Burrows*, *Gunter*, and *Gellibrand:* Of whom the *firſt* found the Declination A. 1580. to be 11 *d.* 16′; the *ſecond*, 5 *d.* 36′. 30″. A. 1622; the *third*, 4 *d.* 3′. 30″. A. 1634.

Laſtly, It being now certain, that the Needles Declination *varieth* in one and the ſame place; the accurate Obſervations of the ſubſequent years will ſhew, How far this Deflexion will proceed, and where, and in what diſtance from the true Meridian, the very bounds of this Declination really are; eſpecially, Whether this Libration and Variation will be the ſame, and regular at all times and in all places; or whether, and how long, it will remain Stationary. All which particulars that they may be accurately diſcovered, is a thing very much deſired. Poſſibly conſiderable ſpeculations and reſearches may ariſe from ſuch Obſervations. As for me, I am almoſt of the opinion, that this Magnetical Diverſity comes from the Motion of the Earth. Doubtleſs, as there is a certain Libration in the Moon, ſo 'tis not abſurd to me, to hold a kind of Libration in the Earth, from the Annual and Diurnal motion of the ſame. For that the cauſe of this Declination and Variation of the Load-ſtone is inherent in the Stone it ſelf, or to be aſcribed to Æthereal Corpuſcles, is not imaginable by me; nor can I yet deviſe any cauſe of thoſe Appearances, except we impute them to the Globe of the Earth, and the Variation of the Meridian. But this ſubtile Queſtion I leave to deeper Wits to diſcuſſe. What you in *England* have lately performed in this matter, I ſhould be very glad to be informed of.

I ſhall conclude with acquainting you, that I lately received from one, that liveth on the ſide of the *Baltick* Sea, a piece of *Amber*, which is ſo ſoft, that I printed my Seal on it. It is yellowiſh, as moſt Amber is; tranſparent, and burning as other Amber; but its ſcent ſtronger, as if it were a kind of glutinous *Bitumen*; and yet it hath been caſt up from the Sea this year, and was found among other pieces. His Brother, a very credible perſon, related at the ſame time, that he had been maſter of a ſmall piece of Amber, ſoft on one ſide, and very hard on the other, wherein lay buried a Fly.

A Letter of Mr. Joſeph Childrey *to the Right Reverend* Seth *Lord Biſhop of* Sarum, *containing ſome Animaverſions upon the Reverend Dr.* John Wallis's *Hypotheſis about the* Flux and Reflux *of the Sea, publiſh't N°. 16. of theſe Tracts.*

MY Lord, The laſt Summer I acquainted your Lordſhip, that I had in my mind animadverted ſomethings upon Dr. *Wallis*'s Hypotheſis concerning the *Flux* and *Reflux* of the Sea; which I have at length gotten time to put in writing, and here preſent them incloſed to your Lordſhip. If upon peruſal of them, you ſhall think them worth tranſmitting to Dr. *Wallis*, or communicating them to the *R. Society*, I only deſire your Lordſhips and Their favourable cenſure of my judgment and reaſons.

The Animadverſions themſelves.

MY intention is not to argue againſt that part of the Hypotheſis, that relates to the *Common Center of Gravity* of the *Earth and Moon*, and the *Diurnal* and *Menſtrual* viciſſitudes of the Tydes, the Authors diſcourſe being (in my judgment) ſo rational and ſatisfactory as to thoſe, that I cannot ſee what clear objection can be made againſt it. But that which I would beg his leave to except againſt, till better reaſon convince me, is his opinion concerning the *Annual* viciſſitudes, and the true cauſe thereof, which he ſuppoſeth to be quite another thing from the Common center of Gravity, namely the *Inequality* of the *Natural Days*. For I fear he may be miſtaken in the time of the *Annual* viciſſitudes, which he contendeth to be about *Allhallontide* and *Candlemas*: And the reaſons of my fear are theſe;

1. Becauſe, if he dare ſtand to the general judgment of Seamen, which I conceive is more to be truſted than that of the Inhabitants of *Rumney-marſh*, he will (I dare aſſure him) find very few of our Engliſh Seamen of that mind, who uſe to ſay, either that the time of the year ſignifieth nothing at all, or, if it do, that the higheſt Tydes of the year ſeem to happen rather about the *Equinoxes*, than thoſe two other aſſigned times, when the Natural days are longeſt and ſhorteſt.

2. Whereas he gives an inſtance or two (pag. 276.) of very high Tydes in the *Thames* in *November* 1660. and 1665; the truth of which we need not queſtion, and of which there are ſundry other the like inſtances in our Engliſh Chronicles; I have reaſon to believe, that thoſe high Tydes proceed from another cauſe, than he ſuppoſeth. For *Firſt*, If that which he ſuppoſeth ſhould be the cauſe, the like high Tydes might be expected every *November*, and (which is more) they ſhould happen as frequently about *February* as about *November*; of which yet he gives not one inſtance. And (which is yet more, and very conſiderable) though I have peruſed throughly that perfect Collection I have of all the high Tydes in the *Thames*, that our *Chronicles* take notice of ſince the Conqueſt, I can hardly find one ſuch high Tyde in the *Thames* in *February*, or thereabouts. *Secondly*, Thoſe high Tydes in the *Thames* in *November*, if we dare credit the *London*-

Watermen, are cauſed by the coming down of the Land-waters after a very great rain, which being encountred by the Tyde of the flood from the mouth of the *Thames*, cannot but ſwell to an unuſual height: To induce us to believe which, we need only conſider, that the latter end of *October*, and beginning of *November* (or rather both thoſe whole Months) are generally the rainieſt part of the whole year. Now if the great rains fall ſo, that the Land-waters come down to the flowing part of the *Thames*, juſt upon the *Full* or *Change*, when the Spring-Tydes happen, as they did (for example) *Septemb.* 30. 1555, and *October* 22. 1629. (*Stow* and *Hows* are my Authors,) thoſe Spring-Tydes muſt be the higher, as proceeding from a double cauſe. But,

3. (To ſay no more of the *Thames*, but to conſider that and other great Rivers jointly with the Sea,) there is another thing notoriouſly known by all Seamen to be a cauſe of High or Low Tydes, which I cannot but ſay, that I wonder, the Author hath taken ſo little or no notice of in his Eſſay, namely the ſitting of the *Wind* at ſuch or ſuch a point of compaſs, and blowing hard. It is the conſtant ſaying of all Sea-men in *Kent*, that ever I met with, that the North-weſt-wind makes the higheſt Tydes in the *Thames*, *Medway*, and all the coaſts about the *South* and *North-forelands*; and likewiſe on the coaſt of *Holland* and *Flanders*. And the reaſon they alledge for it, is, becauſe (ſay they) *that* wind doth with equal force blow in the Tyde of Flood at both ends of this Iſland of *Britain*, that is, from the North-ward between the Coaſts of *Scotland*, *Norway*, and *Jutland*; and alſo from the Weſt-ward by the Coaſts of *Cornwall*, *Devonſhire*, *Dorſetſhire*, &c. up a long the *Sleeve*; and for the ſame reaſon they ſay (and I think truly) that a South-Eaſt wind deads and hinders the Tydes in the place beforementioned near the *Forelands*. And agreeably to this, (if the teſtimony of Youth may be admitted) I very well remember when I was a boy, and lived at home with my Father at *Rocheſter*, which is near enough to *Chatham*, to obſerve, how the Tydes run there; that when the Tydes were unuſually High, the Wind was always North-weſt, and the Moon near the Full, or Change. And ſo confident I am of my memory in this point, that if enquiry be made about *Chatham*, the *Hundred* of *Hoo*, and the *Iſle* of *Graine*, I believe the Inhabitants will with one voyce ſay, that they never fear their Low Marſhes being

overflowed by the Tyde, but when the wind is at North weſt, or thereabout, upon the Spring-Tydes. Here at *Weymouth* thoſe able and antient Seamen, I have talked with, tell me, that a SSE. wind makes the greateſt Tydes, and that according to the degree of the wind, *cæteris paribus*, the Tydes riſe more or leſs notably; but that they never obſerve any extraordinary ſwelling Tydes about *Allhallontide* or *Candlemas*, unleſs the wind be about SSE. And the reaſon they give for that winds raiſing the Tydes there, is (in my opinion) very convincing, if we conſider the lying of the Haven in the Map. And for the ſame reaſon I ſuppoſe the wind from the ſame point may make the Higheſt Tydes at *Southhampton*; a Weſterly wind at *Briſtol*, and *Severne*; an Eaſterly wind at *Hull*; a North-Eaſt wind at *Wisbych* and *Lyn*; a Southerly wind upon the oppoſite Coaſts of *England* and *Ireland*, &c. And as confident I am, that if more particular enquiry be made in *Rumney-Marſh*, it will be found, that *Dimchurch-wall* is never in danger of being overflowed or broken by the Tydes, but upon very ſtormy and tempeſtuous weather; eſpecially when the Wind either blows right-on upon the Shore, or when it ſits in that point, that raiſeth the Tydes higheſt there. Whether the North-weſt wind (becauſe of the little diſtance of *Rumney-Marſh* from the *Forelands*) be the raiſing wind or no, I cannot certainly affirm; but ſo much I believe, that were it not for the running out of the *Neſſe-point* on this ſide (which makes the Coaſt a Bay,) and the running out of *Blackneſſe-point* in *France* on the otherſide, *Dimchurch-wall* would be more ſecure, and need leſs conſtant Reparation than it doth. And if we do but conſider, that *Allhallontide* and *Candlemas* are no more famous for the longeſt and ſhorteſt Natural days, than they are generally infamous for ſtormy weather; eſpecially the former ſeaſon, (wet and windy weather being moſt concomitant,) we have good ground to attribute high Tydes, at thoſe times of the year, to another cauſe, than the Author ſuppoſeth; and make a more than probable conjecture at the occaſion of the miſtake. It is true, *March* is very often more ſtormy than *February* (though ſeldome ſo ſtormy as *October* and *November*) which poſſibly might occaſion that opinion, which ſome hold, (of which number, *Pliny* is one,) that the higheſt Tydes are about the *Equinoxes*. And if the thing were found to hit pretty frequently in *March*, men might not be careful to obſerve the other *Equinox*; though yet it cannot be denyed, that we have bluſtering weather many times before *Michaelmas*. In confirmation of all this, that I have ſaid concerning the influence of the wind's being conſiderable on the Tydes, I ſhall add theſe following Collections of my own out of Hiſtories, Chronicles, &c.

1250. *Octob.* 1. (ſaith *Holinſhead*) upon the change of the Moon, was a moſt dreadful Inundation of the Sea, that did exceeding much hurt to *Holland* beyond Sea, *Holland* in *Lincolnſhire*, and the Marſh ground in *Flanders*, and drowned *Winchelſea*. But he tells us withal, that an un-heard of Tempeſt of wind accompanyed it.

1555. *Sept.* 30. (ſaith *Stow*) was a notable Inundation of the *Thames*; but he ſaith withal, that it was by occaſion of a great Wind, and Rain, that had fallen.

$15\frac{69}{70}$. *March* 10. I find this Manuſcript note in *Latin* in an *Ephemerides* for that year, over againſt the day; *Septentrionis ma-*

and by South, as it had been for two days before very boyſterous, the *Thames* was made ſo void of water, by forcing out the Freſh and keeping back the Salt, that men in divers places might go 200 Paces over, and then fling a Stone to Land, *&c.*

1600. *Decemb.* 8. ſt. v. I find this note written in another *Ephemerides* for that year, over againſt the day, by an unknown perſon, who (as it ſeems) was then at *Venice* (where a South-Eaſt wind makes the higheſt Tydes) *Inundatio Venetiis 6. ped. temp. Sirocco.*

1601. (ſaith *Grimſton* in his *Netherland Hiſtory*.) the Sea being forc'd in by a ſtrong N W. wind, did ſome miſchief to *Oſtend.*

1601. *Octob.* 26. ſt. n. a Great tempeſt (ſaith the ſame Author) and the wind Weſt and North-weſt, and the Tyde much higher than uſual at *Oſtend.*

1602. *Febr.* 23, 24. ſt. n. blew a terrible North-weſt wind, which made the water riſe higher than uſual at *Oſtend.* *Idem.*

1604. *March* 1. n. ſt. the wind was very great at Weſt and North-weſt with a furious tempeſt, the Tyde at *Oſtend* riſing ſo high as it had not done in Forty years before. *Idem.*

4. There is yet another thing, which ſeems to have (at leaſt) ſome influence on the Tydes, and to make them ſwell higher than

elſe they would do, to wit the *Perigæoſis* of the Moon. And this hath been my opinion (taken up firſt upon the conſideration of the Moons coming nearer the Earth) ever ſince 1652, when living at *Feverſham* in *Kent* near the Sea, I found by obſerving the Tydes, (as often as I had leiſure,) that there might be ſome truth in my Conjecture; and therefore in a little Pamphlet, publiſhed in 1653. by the name of *Syzygiaſticon inſtauratum*, I deſired, that others would obſerve that year, whether the Spring-Tydes after thoſe Fulls and Changes, when the Moon was in *Perigæo* (the wind together conſidered) were not higher than uſual. And ſince that time I have found ſeveral high Tydes and Inundations (though I muſt not ſay *all*,) to happen upon the Moons being in, or very near her *Perigæum*. For Example,

1. That famous Inundation, mentioned before out of *Holinſhead*, 1250. *Octob.* 1. was, when the Moon was in *Perigæo*, as appears by Calculation.

2. 1530. *Novemb.* 5. That Inundation on which was made the Diſtick,

> *Anno ter deno poſt ſeſquimille, Novembris*
> *Quintâ, ſtat ſalſis* Zelandia *tota ſub undis*;

was, when the Moon was in *Perigæo.*

3. *Jan.* 13. 155$\frac{1}{2}$. the Sea (ſaith *Michell* in his Chronicle) brake in at *Sandwich*, and overflowed all the Marſhes thereabout, and drowned much Cattel: the Moon in *Perigæo.*

4. 1570. *Novemb.* 1. was a dreadful Flood at *Antwerp*, and on all the Coaſts of *Holland*, that made infinite ſpoyl: the Moon in *Perigæo.*

5. 1600. *Decemb.* 8. above mentioned: the Moon in *Perigæo.*

6. 160$\frac{6}{7}$. *Jan.* 20. was a great Inundation in *Severne*, mentioned in *Howes*'s Chronicle, that did much hurt in *Somerſetſhire*, and *Glouceſterſhire*, &c. the Moon in *Perigæo.*

7. 1555. *Septemb.* 30. (forgotten in its due place:) the Moon was in *Perigæo.*

8. 1643. *Jan.* 23. ſt.n. (ſaith a little *Low-Dutch* Chronicle that I have) was a terrible high Water-flood in *Frieſland*, &c. whereby much hurt was done to the Dykes; and at *Gaes* by *Haerlingen* the Dead bodies ſtreamed out of the Earth: the Moon in *Perigæo.*

9. 1651. *Feb.* 23. ſt. n. (ſaith the ſame Chronicle) was St. *Peters* High flood, whereby much hurt was done to the Dykes in

Frieſland,

Friezland, *Embderland*, and elſewhere, and not far from *Dockum* by *Oudt-woudumer-ziil* is a breach of 42 roods long broken in the Dyke: the Moon in *Perigæo*.

10. *Auguſt* 2. 1657. ſt. v. at *Feverſham* (where I then lived) was a very high Spring-Tyde, and yet the wind was at South-Eaſt; which deads the Tydes there: the Moon in *Perigæo*.

11. *Auguſt* 22. 1658. ſt. v. at *Feverſham* was a very high Tyde in the After-noon, though the wind was Southerly, and blew very ſtiff, which the Seamen there wondered at: the Moon in *Perigæo*.

12. 1651. Upon *Michaelmas* day was a great overflowing of the *Severn*, that it drowned the low grounds lying by it. I lived then in *Gloceſter-ſhire*, and immediately as ſoon as I heard of it, I noted it down in my memorandums: the Moon in *Perigæo*.

13. The Scheme of the weather printed in the Hiſtory of the *R. Society* tells us, that *May* 24. 1663. was a very great Tyde at *London*. But it tells us withall that the ſame day the Moon was in *Perigæo*.

14 *Sept.* 1. 1669. Here at *Weymouth*, I obſerved my ſelf a very high Tyde; and ſo did ſeveral Seamen in that Town, who wondered at it, the weather being very calm, and that little wind that was being at North-Eaſt, which uſes to contribute nothing at all to the Tydes in that haven: the Moon in *Perigæo*.

Further, that which inclines mee to believe, that the *Perigæoſis* of the Moon is of ſome concernment in this matter, is, becauſe it is a Maxim amongſt our *Kentiſh* Seamen, that they never have two running Spring-Tydes (as they call them) together, but that the next Spring tyde, after a high running Spring, is proportionably weak and ſlack; which, if true, is very correſpondent to my opinion, becauſe if the Moon be in *Perigæo* at this Spring-tyde, ſhe will be in *Apogæo* at the next.

But I conceive the beſt touch-ſtone to prove the ſoundneſs of my opinion (which I confeſs I never had the opportunity to do yet,) is, to have it obſerved, whether thoſe Neap-tydes be not apparently higher (*conſideratis conſiderandis*) that happen at the Moons being in *Perigæo* either at the firſt or laſt quarter: Becauſe it is a received and demonſtrable truth in Aſtronomy, that the Moon being in *Perigæo* at either quarter comes then nearer the Earth, than when it is in *Perigæo* at the Change or Full. And I could wiſh for the further clearing of this matter, that obſervation were made at *Briſtol* (becauſe there is the moſt conſiderable Flux and Reflux of any Port of England,) Whether this year 1670. the Tydes be not higher (*conſideratis*, &c.) when the ☽ paſſeth ♓. ♈. and ♉, than when ſhe paſſeth through the oppoſite ſigns ♍. ♎ and ♏; and particularly whether the Spring-Tydes be not ſenſibly higher after the *Change*, than after the *Full* in *February*, *March*, and *April*; and higher after the *Full* then after the *Change* in *Auguſt*, *September*, and *October*; and alſo, Whether the Neap-tides in *May* and *June* riſe not apparently higher than expected. I am promiſed, the obſervation ſhall be made here at *Weymouth* for this whole year round; from whence I have already received this account, that this preſent *February* 16$\frac{69}{70}$. the Spring-Tydes ran very high after the *Change*, though the weather were pretty calm, and that wind that was not very favourable to the Tydes, and that the Spring-Tydes after the *Full* were very low, and weak, which is exactly according to my conjecture.

Dr. Wallis's *Anſwer to the foregoing Animadverſions, directed in a Letter to the Publiſher*, March 19. 16$\frac{69}{70}$.

SIR, Yours with the incloſed Animadverſions of M. *Childrey* on my Hypotheſis of *Tydes*, came ſo late to hand on Thurſday laſt (when the Poſt was almoſt ready to be gone) that I had not time, by that Poſt, to give you an account of them. And it is not much, I need to ſay now; for I do not find, that he and I are like much to diſagree.

That the *Winds* have a great influence on the Tydes of particular Coaſts and Havens, according as they are more or leſs ſtiff or ſlack, and blow from this or that part, I do not at all queſtion; but did alwayes take for granted, as generally received, and upon good grounds. And the like I ſay of *Land waters*; which (though as to the Sea they ſignify not much in this point) are, as to In-land Rivers, very conſiderable; eſpecially as to Inundations upon riſing of the Water: Which is rather by Checking than Promoting the Tydes. For certainly, theſe Land-waters, meeting the Tyde of Flood, do hinder it from coming ſo far up the River as otherwiſe it would; and conſequently, if, notwithſtanding ſuch Land-

floods,

flouds,the Tyde flow higher up the River than at other times,this muſt be derived from ſome other cauſe. But, that the Tide and Land-floud ſhould joyntly make a greater Inundation than either ſingly would have done, is not to be doubted. But he need not wonder,that in my *Eſſay*,though I grant both theſe, I ſaid ſo little of either, becauſe it was wholly beſide my buſineſs; which was, to give a *Statical* account of *Stated* Periods (*Diurnal, Menſtrual, Annual*,) ariſing from Regular Motions; not, of *Accidental* Extravagances, ſuch as theſe are: And therefore I did, in the beginning of that Diſcourſe preclude the Conſideration of the Advantage or Diſadvantage,which ſhould ariſe from ſuch uncertain Contingences,as Extrinſecal to that buſineſs.

His *third* thing ſuggeſted, The *Moon's Perigæſis*; is ſo far from being contrary to my *Hypotheſis*,that it is a great Part of it. And (if I do not much miſ-remember,)it is,in one of my Letters to you, expreſly mentioned as ſuch.But foraſmuch as it doth not ſtill fall out at the ſame time of the Day,Month,or Year,I could not make it a Component of any of thoſe noted Periods, Diurnal, Menſtrual or Annual; (and of more Periods than theſe, I did not know that there hath been any general notice taken, of which I might think my ſelf obliged to give an account:) but it may very well influence *any* or *all* of thoſe,according as it falls out advantageous or diſadvantageous for them.

And as I do ſo readily concur with him in all the particulars by him ſuggeſted; ſo I think he will not be difficult in aſſenting to all the Materials of my *Hypotheſis*.

The account which I give of the *Diurnal* and *Menſtrual* Periods (from the *Common Center* of *Gravity* of the Earth and Moon,) he doth allow as very Rational: And conſequently (which is the Foundation of it,) that any Acceleration or Retardation of the Compound motion of the particular parts in the Earth's Surface, is to give ſuch an Accumulation of waters as cauſeth a Tyde; and the Complication of ſuch Accelerations and Retardations, concurring or interfering one with another, doth occaſion the perplex Varieties in them: Of which therefore there is no clear account to be given, without conſidering ſeverally the proper Effects of each,from whence doth reſult the Compound Effect of all together.

Now as to the two moſt ſignal motions of the Earth, the *Diurnal*

nal and *Annual*: if we ſuppoſe them each in themſelves Equal, and both perfectly circular and upon Parallell *Axes*, though neither of them, ſingly conſider'd, would give an Inequality of motion; yet the compound of both together, being ſwifteſt at Midnight and ſloweſt at Noon, (becauſe the compound of both is, in *that*, the Aggregate, in *this*, the difference of them) would give us two Tydes in each *Diurnal* Revolution: But thoſe alwayes at Noon, and Mid-night.

If to theſe we add the *Menſtrual*, whereby the Earth deſcribes a ſmall *Epicycle* about the Common Center of Gravity of the Earth and Moon; and ſuppoſe this alſo Equal in it ſelf, and Circular, about an *Axe* parallell to the reſt: neither would this, of it ſelf, give any Inequality; but, compounded with the reſt, it will. For, *this* compounded with the *Annual*, doth, at the New Moon, *increaſe*; at the Full, *abate* of that motion, as to all parts of the Earth's Surface: But compounded with the *Diurnal* (which, in this caſe, is much the more conſiderable, as recurring every day,) it doth moſt *add* to, or *abate* of, that motion, as to each particular place of the Earth's Surface, when the Moon is in the Meridian of that place, *below* or *above* the Horizon; and would therefore, at thoſe times, give us two Tydes. (For which, and other particulars of like nature, that they may be the better apprehended, I refer my ſelf to the Inſpection of the *Schemes* pertaining to my *Hypotheſis.*)

Now becauſe this coming of the Moon to the *Meridian*, above and below the Horizon, or (as Sea men call it) the Moon's *Southing* and *Northing*, doth, in a Month's time, paſs round the whole circle of 24 hours; hence it comes to paſs, that the time of the Tydes doth ſo alſo: Which I take to be the true Account of the *Menſtrual* period. And becauſe this Compoſition of the *Menſtrual* with the *Diurnal* (which ſeems by the Effect to be moſt predominant, though not to extinguiſh the other,) caſts the time at the *Moon's* being in the *Meridian*; and that of the *Annual* and *Diurnal*, when the *Sun* is in the *Meridian*: When both theſe happen at the ſame time, as at the Full and Change of the *Moon*; the Tydes muſt needs be the greater: Which I take to be the true Account of the *Spring-Tydes*, and *Neap-Tydes*. And thus far (which is the main of my *Hypotheſis*,) he concurs with me, as having given at leaſt a very Rational and Probable Account.

If therefore there be no other Periods of Tydes but theſe; or no other remarkable, my work is done, and I need not be further ſolicitous: For, then there will ſeem to be either no other inequality of motions, or none conſiderable. But, if there be alſo obſervable an *Annual* period, (as very many think there is;) or any other ſuch period, (as perhaps there may be,) then are we to ſeek for the Cauſe thereof in ſomewhat of Inequality, which doth (for the *Annual* Period) *Annually* recur; or (for any other Period,) which doth recur in ſuch a time as that other Period doth require.

Now foraſmuch as the three Motions above mentioned are neither (as was above ſuppoſed) each Equal in it ſelf, or perfectly Circular, nor all on Parallel *Axes*; there is, both as to the Sun, and as to the Moon, at leaſt a double Inequality; the *one*, by reaſon of the *Excentricity*, and (which depends thereon) the *Apogæum* and *Perigæum*; the *other*, by reaſon of the *Obliquity* of the Zodiack and the Moon's Orbite, with the Æquinoctial, and with each other. From every of which doth proceed ſome little Inequality of Motion in the Earth's Surface: But whether ſo much as to make any remarkable alteration in the Tydes, is hardly determinable than by obſervation.

Now for that of the *Moon*, both as to its *Apogæum* and *Perigæum*, (with the Inequality of Motion depending on it;) and as to the Obliquity of its Orbe both with the *Zodiack* and the *Æquator* (which cauſeth another Inequality both in the Motion of *Longitude* and *Right Aſcenſion*,) I have hitherto contented my ſelf to inſinuate it, in one of my Letters on this ſubject, without further inſiſting on it; becauſe I did not know of any Periodical Viciſſitude of Tydes conſonant thereunto. When any ſuch ſhall be diſcovered, we have here a Foundation ready for the Salving of it. But as to any *Annual* Viciſſitude, it is not of uſe, becauſe it doth not Annually recur.

But, becauſe it hath been almoſt generally received, That there is an Obſervable *Annual* Period; I did, for the ſalving of that, apply not the *Inequality of the Natural Dayes*, but thoſe cauſes from whence *that* proceeds, the *Excentricity* of the Sun or Earth's Orb, and the *Obliquity* of the Zodiack. The *former* of theſe, if ſingly conſidered, would caſt thoſe Annual Tydes in *June* and *December* (the times of the Sun's *Apogæum* and *Perigæum*, or rather the Earth's

Aphelium and *Perielium*, when are the ſloweſt and the ſwifteſt Annual motions in the Zodiack:) the *latter*, if conſidered alone, would caſt them upon the two *Æquinoxes*, and the two *Solſtices*, (the times of the Leaſt and of the Greateſt *Right Aſcenſions*:) But if both be joyntly conſidered, they muſt caſt theſe (as they do the greateſt Inequality of the Natural days) at ſome intermediat times, between the *Autumnal Æquinox* in *September*, and the *Perigæum* in *December*; and again, between this *Perigæum*, and the following *Vernal Æquinox* in *March*: As is more than probable (without the trouble of any new computation) from the greateſt Inequality of the Natural Days, ariſing from the ſame cauſes: But whether preciſely at the ſame time with that Inequality, or whether in all parts of the world at any one time, I do not undertake there to determine; but rather believe the contrary, becauſe the different Poſition of places may very much alter the Influence of both or either Cauſes. I did only mention, as a thing very notorious, that it doth ſo conſtantly fall out on the coaſts of *Kent*, and particularly of *Rumney-marſh*, about *Allhallontide* and *Candlemas*.

This Account of the *Annual* Viciſſitude is that only, to which M. *Childrey* doth except; oppoſing *firſt*, the Judgement of Seamen (more conſiderable than that of the Inhabitants of *Rumney-Marſh*,) who uſe to ſay, either that the time of the year ſignifies nothing; or, if at all, it is about the Æquinoxes. Then, that if this be the cauſe, it will be conſtant, and *that* in *February* as well as in *November*. And thirdly, that the Seamen about *Weymouth* have not obſerved any thing ſignal about thoſe Times.

To the *firſt*, I anſwer; if not then, but at the Æquinoxes, then ſo much of the Hypotheſis as concerns the *Excentricity* may be ſpared, (or allowed to be ſo little as not to be remarkable;) and that of the *Obliquity* alone will give a ſufficient account of it. Or if (to which he ſeems rather to incline,) there be no ſuch *Annual* Viciſſitudes at all; then may that of the *Obliquity* be ſpared alſo, and the *Hypotheſis* perfect without it. And, till ſome ſuch be obſerved and acknowledged, it will be ſufficient to ſay, That, though both the *Excentricity* and *Obliquity* do cauſe ſome Inequality in the Motion; yet ſo little, as that in the Tydes it is not remarkable, they falling juſt as if the three Motions, (Annual, Menſtrual, Diurnal,) were all exactly Circular, and on Parallel *Axes*.

To the *ſecond*, which concerns matter of Fact in *Rumney-Marſh*; I ſay, that (according to the beſt account I can there get, and the unanimous conſent as well of Fiſher-men and other Water-men, as of other Inhabitants,) it is conſtant; hardly miſſing (or very ſeldome) any one year (be the weather fair or foul;) and as well about *Candlemaſs*, as about *Allhallontide*, every year, though not then ſo high: Of which (though they do not pretend to give any reaſon of it,) I think a Cauſe may be very rationally aſſigned. For, if you conſult the *Tables* of the *Inequality* of *Natural Days* (which parallel I make uſe of for the Explication of this,) you will find, that about one of the Extreams (in *January*) the Increaſe and Decreaſe of the Natural Days fluctuates very much; ſometime increaſing, ſometime decreaſing, according as this or that of the two Cauſes, thwarting one another, doth prevail: But about the other Extream (in *October*,) it is much otherwiſe; the *Increaſings* and *Decreaſings* going on in a continual courſe for a long time together. And the ſame Cauſes, applyed to the buſineſs of Tydes, may very rationally be ſuppoſed to produce as unequal effects.

To the *third*, That the Sea-men at *Weymouth* have not obſerved any ſuch ſignal Effects about *Allhallontide* and *Candlemas*: It is very poſſible that they have not, and that nothing ſignal on thoſe Coaſts uſeth to happen at thoſe times: For, I fix that matter of Fact principally on *Rumney-Marſh*, (and that it doth there conſtantly happen, I am pretty well out of doubt,) and do but by conjecture extend it to the River of *Thames* (as having its Mouth not far from thoſe Coaſts,) where yet, I think, you can be my Witneſs, that it hath been obſerved ſeveral years to ſucceed accordingly. What variety is on other Coaſts, I am not certain: But (from an Account read in the *R. Society* in my hearing, about the end of the year 1667.) I underſtand that about *Chepſtow-bridge* (and conſonantly, I ſuppoſe, on the *Severne* at other places,) they obſerve the like to happen about the beginning of *March*, and end of *September*, (the one as much *before* the *Vernal*, as the other is *after* the *Autumnal* Æquinox, like as in our caſe it happens,) which they call by the name of *St. Davids-ſtream*, and *Michaelmas-ſtream*; as we do thoſe in Kent, *Candlemas-ſtream*, and *Allhallon-ſtream*: (And when Sea-men take ſo much notice of particular Tydes as to give names to them, 'tis a great preſumption, that it is for ſome remarkable Accident uſually happening at thoſe Seaſons.) Of theſe different Seaſons at *Chepſtow bridge* from thoſe of *Rumney-Marſh*, I gave you my remarks in a Letter of mine to you in *March* following. And the like differences, I ſuppoſe, will be obſervable on other Coaſts, according as their poſitions be advantageous or diſadvantageous to the one or the other of the two Cauſes, on which this *Phænomenon* depends. But ſince it is not yet (it ſeems) agreed, Whether ſuch an *Annual* Phænomenon do happen; or, if ſo, not at that time; (ſo that, for ought yet appears, it may be at the Seaſons I deſign, that is, between the Winter-Solſtice and the two Æquinoxes on either ſide of it; though, on ſeveral Coaſts, ſeverally remote,) I think it beſt to let this part of the *Hypotheſis* ſtand as it is, unrevoked, as that, which, when it ſhall be diſcovered and agreed on, ſtands ready enough to give a rational account of it, and, in the mean time, does no hurt. And in ſuch a Complication of Cauſes ſo abſtruſe, ſcarce any thing but Obſervation will determine, which of the Cauſes, and in what degree, is to be Judged prædominant.

And if to this of the *Sun*'s or *Earth*'s, be added that of the *Obliquity* and *Excentricity* of the *Moon*'s *Orbite* (of which, for the reaſon above-mentioned, I had taken ſo little notice,) it will, if it do no good, at leſt do no hurt. And I the rather think, it may be conſiderable, becauſe the Earth and Moon's Appropinquation and Elongation, doth really alter the Diſtance of the *Common Center* of *Gravity* (of the Earth and Moon) from the Earth (rendring the Earth's *Epicycle* Elliptical;) and much favors what M. *Childrey* obſerves of the Moon in *Perigæo*. And this is the ſum of what I thought proper to return you, upon thoſe Animadverſions, *being*, &c.

An Accompt of ſome Books.

I. *DISSERTATIONES MEDICÆ TRES: 1. De Cauſis fluxûs Menſtrui Mulierum. 2. De Sympathia variarum Corporis partium cum Utero. 3. De Uſu Lactis ad tabidos reficiendos, & de immediato Corporis Alimento. Auth.* Franciſco Bayle, *Doct. Medico.* Toloſæ, 1670. *in* 4°.

THis Ingenious Author to prepare his Reader to a candid reception of theſe Diſcourſes, repreſents in the Preface, how much miſchief and prejudice hath been done to knowledge *both* by intemperate and blind Love of Novelty, *and* by a ſullen and ſervile addiction to bare Antiquity ; and eſteems him to be truly wiſe, who neither admits Falſities upon the ſole account of being Ancient, nor excludeth Truths becauſe of Novelty, but giveth honor to the Fathers of Sciences, with ſafety to Truth, as *the* thing which the authority both of the Ancients and Moderns ought to ſtoop to. Upon which ground he proceeds, ſometimes diſſenting from *Galen* in theſe Eſſay's alledging, *that* Authors own adviſe and practiſe for ſo doing ; and deploring the unhappineſs of the ſtate of Phyſick becauſe of the too great ſervility of adhering to former attainments. Having premiſed this, he doth in the

Firſt Diſſertation examine and reject the opinion of *Galen* and others concerning the Periodicalneſs or Stated returns of that *Flux* ; eſteeming, that that Author and his Followers do only diſcourſe of what is obvious in this Argument, and leave that unexplained what is not ſo ; as, from what cauſe, by what organs, and why at ſtated times that Evacuation is raiſed and performed. And having ſhew'd, that the common Doctrine concerning this Effect in Women contains nothing, which may be acquieſced in, he proceeds to declare and prove his opinion concerning the ſame, *viz.* That, as in the Earth (the fruitfull womb of all Seeds of Plants,) ſo in all the Wombs of Animals, fit for Conception, there concur chiefly three things: A benigne Heat to cheriſh ; a due Fermentation to agitate and dilate; and a due portion of Moiſture, to enter with eaſe into the paſſages open'd by that Fermenting motion. This he maketh out both in Oviparous and Viviparous Animals, and teacheth, that the bloud being agitated and rarified by that Effervescence, ſwels and opens the veſſels, and breaks out into a Profluvium ; *Dumque hoc fervore dilatatur uterus, aperiuntur viæ inconſpicuæ, quibus ſemen maſculinum interius excipitur, quippe quod non hæret in uteri cavitate (in qua Harvæus & alii illud fruſtra quæſivêre) ſed in ipſius ſubſtantiam imbibitur, ubi fœminei ſeminis permiſtione turgeſcit, & radices agit, quibus delatum per apertos fervore meatus ſuccum nutritium accipit: deinde ut in Terra ſolent Plantarum ſemina, caulem profert carneum, Placentam ſcil. uterinam, ex qua fructus inſtar erumpit Ovum, cui ex germine, liquamini innatante, adnaſcitur alia planta mox migratura in animal, tandem in hominem, ſi ex humano ſemine fuerit excitata.*

After this, he inquireth into the Cauſe of that Incaleſcence, and its Periodical viciſſitudes ; as alſo, why 'tis found in

Mulieribus & Si Miis, cùm Equæ, Canes, Vaccæ, &c. *non niſi ſeroſum quid idque paucum ab illo uteri fervore profundant.* The Cauſe of this Fervor he maketh to be a Nitrous Salt collected in the Body. The reaſon of the Periodical returns he aſſigns to be this, that the *Uterus*, like the Earth, having been throughout fermented and dilated by the nitrous particles, and the orifices of the *Tubuli*, which paſs into the cavity of the ſame, opened, the attenuated bloud ruſheth into it, *indeque foras effunditur. Ubi verò ſanguis libere fluit, collectum fermentum abſtergit, quemadmodum aqua è Terra, quam abluit, Nitrum ejicit. Reſtituto deinde in ſtatum priſtinum Utero, idem fermentum colligitur eodem modo quo prius, & nî quid obſtet, ſpatio æquali, pari quantitate congeſtum, & ad ſimilem exaltationem evectum, novam efficit in Utero fermentationem.* And this is to our Author the cauſe of that conſtant Circuit: For the Illuſtration of which, he delivers many particulars concerning the collection of Salt in the *Uterus*, and its Fermentative power, and the Fecundity of *Ægyptian* Woemen by reaſon of their drinking the Nitrous water of the *Nile*, &c. To which he annexes an accompt, *Quare ab Uteri Fervore pleræque Animantes tantùm ſeroſum quid & paucum, Mulieres verò ſanguinem profundant? Quare etiam illæ periodi in aliis Mulieribus ſint longiores, in aliis breviores? Ex quo fonte Menſtruæ purgationes ſupprimantur, vel perperam procedant? Quæ mulieres careant Menſtruis ſine noxa; & quàm vegetum robur, quantáq; vitæ longævitas inde conſequatur? Quænam immodicæ vacuationis Cauſæ?* &c.

In the *ſecond* Diſſertation concerning the *Conſent of many parts of the Body with the Womb*, he firſt declareth, that he underſtands by this *Conſent* nothing elſe, but that the parts are at once affected together from one part *principally* affected, and communicating that affection to others. Then having exploded the common opinions touching the Cauſes of this Sympathy, he offers his own, *viz.* the Vicinity of the parts, and the Community and ſtructure of the Veſſels, by which the vitiated liquors of the body being conveyed from one part to another, may there excite the ſame or different affections. But becauſe this way of Sympathiſing by veſſels hath many conſiderable and un-obvious varieties, he takes pains to examine them at large and to give a Scheme of the whole Oeconomy of the Body of the perfecter Animals, conſidering the diverſity and various uſes of the Veſſels, and the neceſſity of Motion and Senſe, depending from the Brain, the Animal Spirits, and the Syſtem of the Nerves, which, being diſperſed through the whole

Body, cannot but produce this Conſent of parts: For the clearer Explication of which, he gives an Accompt of the Order and Dependency of the Veſſels, by which the various Juyces are diſtributed through the Body; and from all theſe together, (taking in the *Structure* of the parts) he deduceth *firſt* in *General*, the manner, How any one part, being affected, communicateth its affection to others; and then in *Particular*, How the Scituation, and the Connexion of the *Womb*, with other parts, is ſubject to produce the like effects: Where he exſpatiateth to declare, How that from the depravation of the Uterine ferment and bloud, ſo many, ſo various, and ſo horrid Diſeaſes and Symptoms ariſe: To all which he adds the ſolution of theſe two Queſtions; 1. Why Sweet ſmells raiſe Hyſterique paſſions; and fœtid ones, remedy the ſame? 2. Why there is ſo ſpecial a conſent of the Womb with the Breaſts? Concerning both which we refer the Reader to the Author himſelf, and proceed to the

Third Diſſertation, in which he inquires, Whence it is, that *Milk* is the beſt Aliment of the Body? And to ſatisfie this Inquiry, he preſuppoſeth, that the proxime nouriſhment is to be as like as may be to the Body to be nouriſh't, and that we ſubſiſt by the ſame things, of which we are generated, and that the Fœtus is fed in the womb, not with Bloud, but a Milky Juyce, taken in at the Mouth, and ſever'd from the Bloud in the *Vterus* by the *Placenta*, as a Strainer; as 'tis in the *Breaſts* by the Glanduls and Tubes deſigned for the ſame purpoſe. And having concluded thereupon, that Meats do not nouriſh before they are converted into a Milky liquor; he Analyſeth Milk, and finding, that its fatty, terreſtrial, and ſerous parts may be eaſily mixed, ſeparated again, and made a fit matter for the different parts of the Body, the Serous part thereof (which is alſo Nitrous) being a very proper Vehicle to conveigh it thorough the veſſels; he infers, that it is the moſt convenient Food, not for Children only, but for Grown people alſo. But becauſe he was aware of divers Objections againſt this Doctrine, eſpecially thoſe two, that are taken from the double Principle of our Generation, the Bloud, and the Genital ſeed; and from the two ſorts of Parts of the Body, Spermatick and Sanguineous: He endeavors to remove both, as may be ſeen in the Book it ſelf; where do occur ſundry curious and conſiderable Anatomical Obſervations and Experiments, grounded upon the Learned Dr. *Whartons* Book of *Glanduls*, and proving, that the

Maternal Bloud is neither the matter of the Aliment of the *Fœtus*, nor that, of which it is firſt formed: all which is illuſtrated and confirmed from the *Phænomena* in *Oviparous* Animals, whoſe young ones, bred in Eggs, receive no bloud at all from their Dams.

But as to the ſucceſſive Changes made in Meats, fit for Nutrition and the production of various Juyces; he repreſents them thus: After that the *Chyle*, produced out of meat and drink in the ſtomach, hath paſſed to the Heart, then the fineſt and moſt Spirituous parts thereof are changed into the red part of the Bloud; ſuch portions as are diſpoſed next, are turned into Bile, and other humors; the remainder is by iterated fermentations with the Bloud in the Heart further digeſted, and perfected, and by being in many places percolated, and leaving behind its ſeroſity, acquireth a glutinous and fibrous nature, like Milk, fitteſt for Nutrition.

So that he concludes upon the whole, That there being no part of the Body, which is not generated of the Seed, and conſequently the Seminal matter being the neareſt Aliment of the ſame, and nothing, of things outwardly taken in, having a greater cognation with it, than Milk, this Liquor is to be eſteem'd the beſt Aliment, and the propereſt to repair tabid and decayed Perſons.

II. *HISTORIÆ GENERALIS INSECTORUM*, Johannis Swammerdani, *Pars prima.* Ultrajecti *A.* 1669. in 4°.

THis Curious and Philoſophical Book, written in the *Belgick* Tongue, treateth chiefly of theſe three things.

Firſt, It lays down the Ground of all Natural *Changes* in Inſects; declaring, that by the word *Change*, is nothing elſe to be underſtood but a gradual and natural Evolution and Growth of the parts; not any Metamorphoſis or Transformation of them: which Growth is here made to reſemble, not only the Increaſe of other Animals, but alſo the Budding, Knitting and Spreading of Plants. And here the Author, having taken notice, that, whereas Antient and Famous Writers have eſteem'd and called the *Nympha*, among Inſects, the Change of that Worm, which carries the proper ſhape of the future little Animal; and the *Chryſalis* or *Aurelia* the Change of that Caterpillar, which ſhews no parts at all of the Animal to come; having, I ſay, noted this, deſires the Reader to obſerve, that, whereas he is able to diſcern and to ſhew all the parts or members of the future Animalcle, as well in the *Chryſalis*, as the *Nympha*, he makes no other difference amongſt them, but this, That ſince the parts in a *Chryſalis*, are not ſo plainly diſcernable to our view, as thoſe in a *Nympha*, and becauſe a *Chryſalis* does ſometimes appear of a Gilt-colour, which he hath not hitherto obſerv'd in a *Nympha*, he calls the *Nympha*, barely by the name of *Puppet*, and the *Chryſalis* by that of *Gilt-puppet:* the diſtinction of which is made very clear by the neat and accurate Cuts annexed, and their Explication. In this *Firſt part* is ſet forth the manner, how the *Worms* and *Caterpillars* turn into *Puppets*; and ſhewed, *that* ſome Inſects come perfect out of the Egg, and never out of a Puppet; *that* the principal difference of the *Worm-animalcula*, that turn into *Puppets*, conſiſts in this, that ſome have feet, ſome have none; *that* the breaſt of the feetleſs Worms is never changed; *that* the ſix fore-feet of the Worms with many or few feet are never changed or tranſpoſed; *that* the Wings, Horns, Feet, *&c.* grow up under the skin by degrees; *that* in all Worms he can eaſily ſhew the ſaid parts under the skin, affirming, to have done it actually in the preſence of Seignieur *Magaletti*, and Monſieur *Thevenot*, Two very Intelligent and Cautious perſons; and *that* even a *Frog* comes forth into a Puppet.

[illegible]

of [illegible] hath been obſcured and marred; ſhewing withal, how it is to be cleared and reſtored again. Where he affirms, that *Moufet* and others do erre about the *Aurelia*, making it neither an Egg, nor an Animal; and that *Harvey* miſtaketh, calling the *Aurelia* (which indeed is the Animal it ſelf,) an Egg, and affirming, that Bloudleſſe *Animalcula* are produced out of *Aurelia's* by Transformation; whereas the Change, happening in the *Puppets*, is nothing elſe but an Evaporation of the ſuperfluous moiſture. Further, that *Goedartus* erres, holding, that a *Caterpillar* may change before her time; and that, if ſhe ſo changes, ſhe then produceth another Animal: Contrary whereunto our Author affirms, that theſe *Animalcula*, which the ſaid *Goedartus* mentions, as changing againſt the order of nature, do *always* come forth in that manner, *viz.* The Male with wings, and the Female without them: Obſerving further, That *Caterpillars* early forbearing to eat, come only to turn into ſmaller bodied Animals; and adding, that they may change when they will; and that the Animals, when once changed, do never grow bigger. And from the knowledge of the propagation of theſe *Animalcula*, he is of opinion, that we may arrive to that of the Propagation of the reſt of Animals; where he declareth his ſentiment, that there is no *Generation* in Nature, but only a Production by the Growing of parts; adding this aſſertion, that he is able *both* to ſhew all the parts of a *Butterfly* in a Caterpillar, *and* to make the change of the Caterpillar to proceed leiſurely, and ſo to ſtop it in its change, that it ſhall appear half *Caterpillar*, and half *Aurelia*; which he ſaith, he hath actually performed before the now Great Duke of *Toſcany*.

Thirdly, This Author reduceth all *Changes* of Inſects, (ſome few excepted, which he acknowledgeth he doth not yet well underſtand,) into *Four* Claſſes or Ranks; which are diſcriminated by *four* different ways of

Production, Change and Growth. The *firſt* Rank, by him called *Nympha-Animal*, hath a little Animal fully formed in the Egg, which after the evaporation of the ſuperfluous moiſture, comes forth perfect and ſo groweth up; ſuch as the *Lowſe* and *Flea*, &c. The *ſecond* called *Nympha-Vermiculus*, hath the parts of the Inſect imperfectly ſhaped in the Egg, and after hatching acquires its perfection *Viſibly* by outward food; ſuch as the *Locuſt* and *Cricket*, &c. The *third*, called *Nympha-Chryſalis* or *Aurelia*, obtains after hatching, its perfection *darkly*, and not till the laſt caſting of the skin; ſuch as the *Emmet*, and *Night-butterfly*: So that in the *ſecond* and *third* Claſſis not a perfect *Animal*, but a *Worm*, precedes the growing up of the parts; yet with this difference, that in the *ſecond*, the little Creature groweth up manifeſtly; which in the *third* is done obſcurely: The *fourth*, called *Nympha vermiformis*, remains always ſhut up in the skin of the Worm, without a poſſibility of diſcerning the parts, till caſting both skins at once, it becoms capable of generation; ſuch as the *Fly*.

In the Explication and Deduction of all which differences, the Author taketh notice of many remarkable particulars: *E.g. That* the Inſects, which come perfect out of their Eggs, change only by caſting their skin; and thoſe that come forth imperfect, do, beſides skin-caſting, grow up by food, to become *Nympha*'s or Puppets: *That* thoſe, which come perfect or imperfect out of the Egg, are in the Egg firſt like Puppets, and undergo, both of them in the Egg, all the alterations, which any Inſect undergoeth in the Puppet: *That* the parts of *Puppets* protuberate, much like the Budding of Flowers: *That* the *Caterpillar* is the *Butterfly* it ſelf, only covered over with a mantle, whereby the parts are kept from our diſcerning: *That* the doctrine of Seigneur *Malpighi*, in his Diſſertation de *Bombyce* (dedicated to the *R. Society*,) concerning the Change of *Butterflyes*, is true: *That* innumerable Inſects fly about and feed by night, as well as others do by day: *That Snails* diſcharge their excrements by the neck, and are each of them, both Male and Female: *That* from *Caterpillars*, feeding on ſuch and ſuch plants, conjectures may be drawn concerning the agreement of the reſpective qualities of them; it being very probable, that, if thoſe Creatures do eat of ſeveral plants (each ſort of thoſe Inſects being eſteem'd, to feed but on one ſort of Vegetables) thoſe Plants do agree in their nature and vertues, *&c.*

Thoſe Inſects, which the Author can as yet reduce to no *Claſſis*, are;

Cicindela.
Scolopendra.
Julus.
Curculio.
Scarabæus pilularius.
Hydrocantharis.
Hydrocantharis minimus.
Scorpio

III. *The* CREED *of M.* HOBBES, *Examined by M.* Teniſon. London, 1670. *in* 8°.

PAſſing by the ſeveral particulars, which concern *Morality* and *Policy*, diſcuſſed in this Book, as not belonging to theſe Tracts, which are principally deſigned to give an Accompt of ſuch Occurrences as are of a Phyſical and Mathematical nature; We ſhall only take notice of the Ingenious Confutation, made by this Author, of what M. *Hobbes* hath delivered concerning the *Rational Soul*, and *Perception* in *Matter*; Where (in my opinion) it is ſtrongly evinced, That the *Soul of man* is ſomething elſe, than the Organized Body in due motion; and that 'tis altogether unconceivable and therefore moſt un-philoſophical, that *Matter* ſhould be capable of Perception, Cogitation, and Diſcourſe. In the doing of which, our Author deſcends to particulars, making it out, that *Senſation* is not made by Motion or Reaction in meer Matter; nor that Imagination, Memory, much leſs Reaſon, are meerly Mechanical; refuting alſo that Dogme, which maketh Reaſon nothing but an apt joyning of *Names*. All which ſeems to be performed with ſo much force, that it appeares not, what in reaſon can be rejoyned thereto; which yet is not ſaid without a ready ſubmiſſion to better judgments.

IV. *FRANCISCI JOSEPHI BURRHI Epiſtolæ duæ ad Thomam Bartholinum.* Hafniæ, 1669. in 4°.

THis ſmall Tract being but very lately ſent out of *Denmark* to the Publiſher, he thought fit to give forthwith the following Accompt of it.

Theſe two Letters of Signeur *Burrhi* are an Anſwer to two others, which M. *Bartholin* had written to him touching ſundry conſiderable and curious Subjects of Natural Philoſophy and Medicine.

In the *former* he endeavours to explain, How the *Brain* is formed, and what kind of Subſtance it is: In the doing of which he obſerveth, That as many Salts, diſſolved together in common water, are ſever'd by a ſimple Diſtillation; and as divers Mettals melted together into one maſſe are un-mixed from one another, when a certain degree of heat is given them; ſo the different parts, which conſtitute the *Seed*, although they be ſo blended together that 'tis impoſſible to diſtinguiſh them, do diſ-engage themſelves from one another when they are agitated by a competent Heat; and taking the ſituation which is natural to them, give riſe to the ſeveral Organs of the Body. The direct and the moſt maſſy, by their weight going to the Center, form the *Heart*; the ſpongious, the *Lungs*; the bituminous, the *Liver*, and the fatty and oily, as the higheſt, riſing above the reſt, form the *Brain*, &c. Where he takes notice, that *Hippocrates* holds the Brain to have little of Oylines in it, becauſe it will not flame; whereas he aſſures, that having diſtilled the Brain of a Calf, he drew from it a conſiderable quantity of Oyl: which (to note that by the by) being applyed outwardly, is by him recommended as excellent to appeaſe the pains of the *Gout*.

In the ſame Letter he affirms, that in the Brain there is made a certain very ſubtile and well-ſcented liquor, which he believes to be the Seat of the Reaſonable Soul; and that the Wit of men depends on the Temper of this Liquor, rather than from the Conformation of the Brain: Which he confirms by the Example of one, who by taking great ſtore of *Tobacco*, had ſo dryed up his Brain, that after his death there was found in his Head but a very ſmall black clod, compoſed of ſundry membrans; and yet his Soul had not been wanting to perform her functions to the laſt.

He alſo takes occaſion to diſcourſe of *Reſpiration*, adventuring to affirm, that Reſpiration is cauſed by divers liquors, which riſing through the Veins into the Heart, and there fermenting, ſend to the Lungs ſuch Vapors as attract the Air: For illuſtration whereof, he ſaith, That, if to a Glaſs-bowl, hollow and with a ſmall hole, you ſodder divers Pipes of Glaſs half full of different ſtrong Liquors, the Vapours, elevated from thoſe Pipes in the glaſs-bowl, will draw the Air after the ſame manner as tis drawn into the Lungs by Reſpiration.

In the *other* Letter, he treats of the way of curing ſeveral Diſtempers of the Eyes, and particularly of ſome ſurprizing ones, cured by himſelf. Where he affirms, that, having cut aſunder the Apple of the Eye of divers Animals, and ſqueeſed out the humors even the *Chryſtallin* it ſelf, he hath reſtored the ſight to thoſe Animals; and that the Eyes of thoſe Birds, on which he had made this Experiment, looked better and more vivid than before; and that he had performed this operation upon many perſons with ſo much ſucceſs, that in their Eyes there remained not the leaſt appearance of a Scar. After this relation he is not ſhy to teach the way of making this Operation, adding the cautions to be obſerved therein, and withall the Remedy it ſelf; which conſiſts chiefly in a certain Water of *Celondine*, and a Phlegme of *Vitriol* of *Mars*.

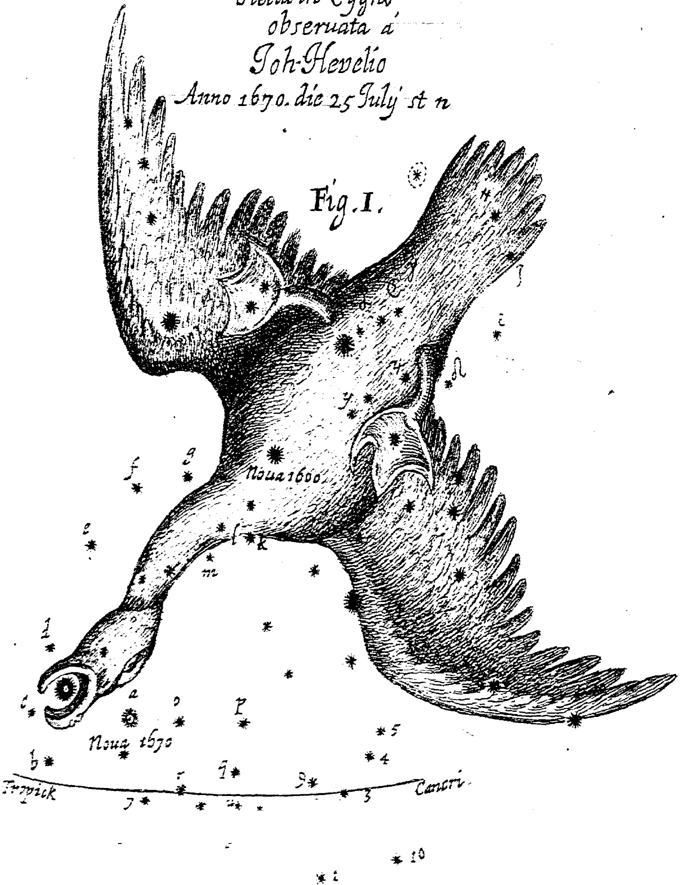
On the occaſion of teaching the Preparation of this remedy, he taketh notice of ſeveral particulars, perhaps not to be deſpiſed: Firſt, That if about a pint of Water be poured on ten pounds of Filings of Iron, freſh and fine, and after having well ſtirr'd it with one's hand, you cover the veſſel, wherein it is, and wrap it about with ſome dry ſtuff, theſe Filings will, within the ſpace of an hour and an half, ferment and grow hot, like *Calx viva*. Secondly, That having often quenched in Water an Ingot of fine Gold, heated red hot, he hath found the weight of that Gold notably diminiſh't; and having afterwards ſuffered the Water to evaporate, drawn a little Gold thence; which (he ſaith) ſhews, that the moſt ſubtile parts of the Gold paſs into the liquors, wherein it is quenched; whence it is (he adds) that ſuch liquors have admirable vertues, to cure many Diſeaſes: And amongſt others he pretends, that in *Dyſſenteries* there is no better Remedy, than Roſe-water, wherein Gold hath been quenched. Thirdly, That in the Reſolution of *Simples*, an excellent means of preſerving their proper virtues is, inſtead of uſing Fire or any other ſtrange Heat, which might alter their vertues, to employ only the Warmth of an Hot-bed made of the Putrefaction of the Herbs of the ſame *Species* with thoſe you would Diſtil.

LONDON,
Printed for John Martyn, *Printer to the* Royal Society.

Tab. 1.

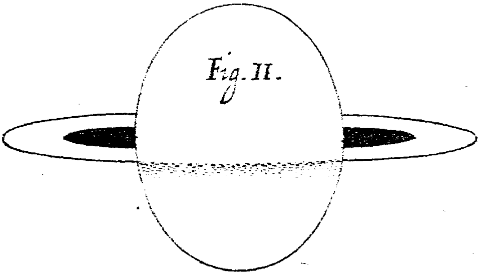
Stella in Cygno
obseruata á
Joh. Hevelio
Anno 1670. die 25 July st n

Fig. I.



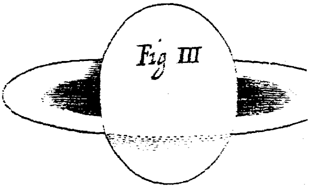
Saturnus obseruatus
GEDANI
Anno 1670. die 26 Augusti.
á
Joh. Hevelio.

Fig. II.



Sat. obs. Lond.
á R. Hook.
Septembr $\frac{26}{16}$ 1670.

Fig III



Numb. 65.

PHILOSOPHICAL TRANSACTIONS.

Novemb. 14. 1670.

The CONTENTS.

An Extract of a Letter, intimating two New Anatomical Diſcoveries. A Narrative of divers odd Effects of a dreadful Thunder clap. An Extract of a Letter of M. Hevelius *concerning a* New Star *lately diſcover'd in the Conſtellation of the* Swan; *together with the preſent Appearance of the Planet* Saturn. *An Accompt from* Paris *in two Letters, concerning the* Earlier *diſcovery of the ſame* New Star, *deſcribed in the precedent Letter. Some Communications confirming the preſent Appearance of the Ring about* Saturn, *by M.* Hugens de Zulichem, *and M.* Hook. *An Extract out of a lately Printed Epiſtolary Addreſs to the G. Duke of* Toſcany, *touching ſome Anatomical Engagements of* Laurentius Bellini. *A relation of a late Monſtrous Birth in* Plymouth, *together with the Anatomical Obſervations taken thereupon by Dr.* Will. Durſton. *Some Obſervations on Inſects lodging themſelves in Old Willows; by Dr.* Edmund King, *and* Francis Willoughby *Eſquire. A Confirmation of what was formerly Printed in* Numb. 50. *about the manner of Spiders projecting their Threds; communicated by Mr.* Wray, *and Mr.* Liſter. *An Accompt of ſome Books.* I. *DE CORPORUM AFFECTIONIBUS cum MANIFESTIS tum OCCULTIS, Auth.* J. B. Du Hamel. II. *ELEMENTA PHYSICA, Auth.* Franc. Wilh. *Barone de Nuland.* III. *A Diſcourſe of LOCAL MOTION, Engliſht out of* French. IV. *Congietture Phyſico-Aſtronomiche della Natura del Univerſo, da M.* Cavina; *in Faenza,* 1664. *in* 4°. V. *Dimoſtratione Delle 7. Propoſitioni, Promeſſa da* Dott. Roſetti; *in Firenze* 1668. *in* 4°.

An Extract of a Letter, written to the Publiſher out of France, *Octob.* 29. 1670. *intimating two New* Anatomical *Diſcoveries.*

A Friend of mine, a profeſſed Phyſitian, hath aſſured me, that at *Montpelier*, a *German* hath diſcover'd the veſſels, which convey the Chyle to the Breaſts of Nurſing Women; and ſhew'd, that they do iſſue out of the *Ductus* of Monſieur *Pecquet*. This is a diſcovery of a thing, the *being* of which hath been believed long ſince, though not made out. Another perſon hath aſſured me, that there is certainly another paſſage of the Urine to the Bladder than by the Ureters; an Experiment having been lately made, whereby the Ureters of a Dog were ſo carefully tyed up, that nothing could paſs that way, and yet the Urinary Bladder was found full of Water.

A Narrative of divers odd Effects of a dreadful Thunder-clap, at Stralſund *in* Pomerania, $\frac{19}{29}$ *June* 1670; *taken out of a Relation, there Printed by Authority in High Dutch.*

AFter a very hot ſeaſon from the beginning of this month of *June*, on the $\frac{16}{26}$ of the ſame, early in the morning a great Tempeſt was obſerved, gathering Weſt-South Weſt, of which there appear'd much Lightning, with ſome Thunder only as a far off. On the nineteenth (being Sunday) after ſeveral leſs ſtrong reports of Thunder, the whole Town, and particularly the Congregation in St. *Niclas* Church (when the Miniſter was Preaching) was ſtrangely ſurpriſed with a moſt terrible flaſh of Lightning and a fearful Thunder-clap, which lighted down through the leſſer ſteeple upon the body of the Church, and through the round large hole in the upper Vault within the ſame, in the ſhape (as ſome obſerv'd) of a black fiery ball, directly upon the Altar, cauſing ſuch an hideous crack, fire-flaſh, ſmoak and damp there, as if many fire balls had been thrown down thither from the ſaid Vault, and burſted all at once; begetting a diſmal conſternation among the people, and leaving an ill Sulphureous ſmell behind.

The Candle on the South-ſide of the Altar was put out by the blow, the other remain'd burning. Two of the Chalices there, were overthrown, and the Wine Spilt, and the Wafers ſcatter'd about; but the empty Chalice ſtood firm. All three were ſomewhat ſmutted at the foot, and one of them a little bent there, and in two places pierced through as if it had been by hail-ſhot: And the Wafer-boxes were likewiſe a little ſmutted towards the bottom. The Church-book was flung on the inner paſſage: The Covers of the Altar were ſinged in divers parts, as by powder, and ſomewhat burnt and ſmutted here and there, as alſo torn in ſome places. A ſtrong piece of Wainſcot, with a Picture upon it, behind the great Altar, was ſplit in two. Of the Church clock, in the Weſt-end, at the ſame time, both the Braſs and Iron-Wires of the whole and quarter-hours hammer was partly broken, and the reſt could not be found; and an Oaken Poſt fixt in the wall for the ſupport of the Dyall, was half torn, and beneath the ſame divers Bricks were ſtruck out of the two Head-Pillars ſupporting the Steeple. On the top of the Southern ſteeple, an Oaken Gutter, and a ſtrong Beam and Supporter were ſhatter'd, and fell dangerouſly, but that one part of it held faſt yet by one Nail.

One of the Miniſters, though ſitting near the Altar to the South, had no hurt at all. Divers of the people ſeated round about the Altar fell down to the ground with the fright. One Youth, that ſtood next the ſaid Miniſters Pew, not being able to recover his ſences, was carried home. On the North-ſide of the Altar, four perſons fell down, and one of the Oaken Seats being ſplit under him that ſate thereon, that perſon was much hurt by it, and more than any other. Some that ſtood in or by the Belfree, near the Clock, were ſlightly hurt here and there; and among them a Mariner, leaning on a lined oaken Seat there, had his right arm bruiſed; and another man though but ſlightly hurt, yet could not remember, how he got home from Church.

The Sermon being broke off, and the people making haſt away, ſome obſerv'd, that there iſſued forth a huge Damp out of the Southern Steeple, like unto Smoak which poſſeſſed many with great fears of Fire within; but the Church-Carpenter, upon ſearch of the ſaid Steeple and Church-roof within, met only with a preſent noiſe and thick damp, which, though it frighted him at firſt into an apprehenſion of Fire indeed; yet, getting to the Windows, and opening them, the damp iſſued with great violence, but there appear'd no Fire any where, ſave only a little in the ſhatter'd parts of the Steeple, which was ſoon quenched.

The Church-Dyall was alſo much ſmutted in ſundry parts, ſoiling the gilt figures that they could ſcarce be diſcerned. The gilt Weather-cocks, upon both the Steeples, were likewiſe ſmutted on the one ſide of their Tayles, without any other mark. Nor could it be in the leaſt diſcover'd, in either of the Steeples, which way the Claps entred, by all the ſearch that was made.

Among the perſons, that were any way hurt, (who were but *eight* in all) divers notable particulars were obſerved afterwards, *viz.*

One, that ſtood in the Bel-free, had the upper back-part of his Cloth-coat, as alſo his ſhirt and skin, ſomewhat torn; but the lining of that Coat, which was red-frieze, had no hurt at all, betwixt the reſt.

Another, ſitting in a Pew under the Organs, and leaning on the door, whileſt the Pew-lock (then cloſe to his body) was ſo violently ſtruck out, that it hung only by one Nail, had no dammage at all by it himſelf, nor any other that ſate or ſtood by there, when the ſtroak happen'd, though they fell all to the ground by the fright, at the inſtant when it was given.

And as for him, that had his Arm bruiſed, it was ſomewhat ſtrange, that afterwards there was found a hole paſſing his coat, waſt-coat and ſhirt on the fore-part of his Body, without in the leaſt hurting the Body; the hole appearing juſt as ſhot through. And beſides, notice was taken, that the ſaid man's Waſt-coat (being of a red Sarcenet) kept its colour every where, but at the place where the Arm was hurt; and the waſt-coat being edged with a ſmall Silver-lace, the lace was ſmutted almoſt every where, and about the neck too, where the party wore a Cravate. The ſame perſon had alſo one half of a ſhoe torn off, the ſoal being pierced as with hail-ſhot; and a piece of his ſtockings foot on the ſame foot ſtruck away, near an hand-breadth; without any other hurt to either foot or leg, but that for ſome dayes that foot was benummed.

Laſtly, one of them that ſat by the Altar, had his Breeches and Leather-drawers on both ſides pierced through, as by hail-ſhot, and part of it plainly ſcorch't and ſhrunk up, as by fire; and divers of ſuch ſmall holes in his ſhirt too, yet without any hurt in his body; ſave, that he found ſome pain in his foot. One ſide of his ſhoe alſo was half torn, and the Soal ſidewards pierced through, as 'twere, with hail-ſhot.

Yet there dyed not any one of all them that were hurt; they recovering either of themſelves, or by the advice and help of others.

An Extract of a Letter of M. *Hevelius*, written to the Publiſher from *Dantzick*, Auguſt $\frac{11}{21}$ 1670. Concerning a *New Star*, lately diſcover'd in the Conſtellation of the *Swan*, together with the preſent Appearance of the Planet *Saturn*.

Etiamſi non dubitem, ultimas meas Tibi eſſe traditas, nihilominus tamen hiſce Te rurſus inviſere volui, quo vos de Obſervatione quadam notatu digna certiores facerem, mentemque ſimul meam ea de re vobis exponerem: De Nova *videlicet illa* Fixa *circa* Cygnum, *nuper deprehenſâ; non quidem de illa, quæ in* Pectore *ejus jam Anno* 1600 *illuxit, & Anno* 1660 *rurſus evanuit, ac denuo Anno* 1666. *menſe* Septembri, *inſtar ſtellulæ* Septimæ *magnitudinis emicuit; de qua eo tempore, ſi rectè memini, fuſius vobis perſcripſeram: Sed de Fixa prorſus diverſa,* Tertiæ *magnitudinis ferè, circa & infra caput* Cygni, *inter informes conſpicua, cujus Longitudo* 1°. 52'. 26'' ♒, *& Latitudo* 47°. 25'. 22''. Bor. *modò exiſtit, ut Obſervationes, die* 25 Julii *à me habitæ, luculenter oſtendunt.* Novam *autem ſtellam hanc ipſam omnino eſſe, & in Cœlo ad annum* 1660 *penitus inconſpicuam fuiſſe, non eſt quod quiſquam dubitet. Nam, ut noſti, à pluribus jam annis, &* Planetarum & Fixarum *obſervationibus maximè (quod præfiſcine dixerim) operam dedi, ſic ut non ſolum omnes illas à* Tychone *olim obſervatas, globóque adſcriptas, ſed & reliquas hactenus neglectas, nudo tamen oculo bene conſpicuas, tum* Quartæ *tum* Quintæ *tum* Sextæ *magnitudinis, in quibuſvis Aſteriſmis accuratè notarem, inque catalogum referrem: quo imposterum eo facilius, ſi qua* nova *prodiret Fixa, deprehenderetur. Accidit igitur, ut Anno jam* 1659, 1660, *&* 1661, *pleraque ſtel-*

læ

las illas omnes, in Aſteriſmo Cygni *apparentes, ſummâ diligentiâ debitis Organis dimenſus fuerim; atque ita omnes illas, etiam circa* Collum, & Caput *deprehenſibiles, notaverim, earumque diſtantias à diverſis fixis ceperim; nullam autem ſtellam* tertiæ *magnitudinis, eo loco, ubi jam dicta* nova *notatur, tum deprehendi; quam tamen optime, ſi adfuiſſet, conſpexiſſem. Nam cum* (*ſub nota* 6.7.) *in delineatione noſtra, ſupra ſcilicet cuſpidem alæ Borealis* Aquilæ, *& quidem multo minores, tum* [b] *duarum informium,* Caput Cygni *precedentium, inferiorem, tum ipſum* Caput *ſextæ Magnitudinis, nec non* c, d, n, m, l, k, *Stellas* Sextæ *&* Quintæ *magnitud. probè ac diſtinctè viderim; quidni etiam hanc ad duos treſve gradus ab his remotam, & quidem* Tertiæ *magnit. obſervaſſem? Sic ut primò hinc certus ſim, Anno* 1660 *&* 1661 *hanc ſtellam nondum extitiſſe viſibilem. Deinde, clarè etiam patet ex* Bayeri *Uranometriâ, hanc modò dictam novam Stellam neque Anno* 1603. *apparuiſſe, & per conſequens neque* Tychoni, *multo minus* Hipparcho. *Siquidem &* Bayerus *Fixam tantæ magnitudinis deprehendiſſet, cùm haud procul ab illa aliam* (*ſub numero* 8.) *in meo Schemate* Sextæ *Magnit. depinxerit: prout in Aſteriſmo ejus* Cygni *videre eſt. At, inquies, fortè ea ipſa eſt, quam tu* novam *dicis, quippe cùm Bayerus congruis organis ſtellas illas haud obſervaverit fieri facilè potuit, ut à vero ejus loco ad gradum, vel paulò plus, aberraverit. Sed, crede, id factum non eſt, quandoquidem ſtella illa parvula* (8) *adhuc eodem loco, ubi* Bayerus *ferè eam depoſuit, commoratur, nec major eſt ſtella ſextæ magnitudinis, ut eodem tempore ei videbatur. Diſtat enim, ut ipſemet nuper deprehendi, ab ore* Pegaſi 32°. 39′. 0″; *dextro genu* Pegaſi 39°. 32′. 45″; *hinc provenit ejus Longitudo* 0°. 6′. 28″. ♒, *& Lat.* 46°. 11′. 14″. *Bor. ad annum ſcilicet currentem* 1670. *complet. Julio. At nova* [a] *elongatur ab ore* Pegaſi 32°. 31′. 35″, *& à dextro genu* Pegaſi 38°. 18′. 50″; *ex quibus diſtantiis Longitudo* 1°. 52′. 26″. ♒, *&* Latitudo 47°. 25′. 22″. *Boreal. elicitur. Adeò ut hæc Nova planè ſit diverſa ab illa* ſextæ *magnitudinis, à* Bayero *notata;* (*quanquam hæ duæ nondum ad duos gradus ab invicem removentur.*) *Atque ex dictis manifeſtum ſit, hanc Novam nec anno* 1603. *nec anno* 1660. *inter cœteras emicuiſſe ſtellas. Quò autem Aſtrophili eò diſtinctius tum ſtellam illam, tum locum ejus cognoſcant, volui totum* Cygnum, (*Vid. Tab.* 1. *Fig.* 1.) *cum adhærentibus* *ſtellis, nec non omnibus illis minoribus, Globo hactenus nondum adſcriptis, ac à me per diſtantias varias ſedulo obſervatis, delineatam dare, ac Illuſtriſſimæ* Societati *quantocius tranſmittere; ut ſimul conſtet, quot incognitis Fixis Aſteriſmos omnes, divina ope, hucuſque jam ditaverim ac exornaverim. Ego ſolo* Cygno 35. *addidi; quippe* Tycho *non niſi* 18. *in ſuo Catalogo exhibet, quibus* Kepplerus 8 *addidit, ſic ut Conſtellatio* Cygni *in Globo noſtro* 60. *ferè ſtellis fixis nunc luceat. De cætero, bene impoſterum attendendum erit, an ſæpius dicta Stella* [a] *in eadem magnitudine ſit permanſura; an verò ratione magnitudinis luminiſque diverſam aliquam induerit faciem? Cùm primitus à me obſervabatur, quoad* magnitudinem *& ſplendorem, ſtellæ in* Pectore Aquilæ *æquabatur, niſi quòd aliquanto obtuſioris fuerit luminis; quoad* ſitum, *reſpectu reliquarum ſtellarum, in linea recta cum illa in Ancone alæ ſuperioris* Cygni, *& illâ in humero* Aquilæ, *nec non cum lucida* Lyræ, *& illâ in Rhombo* Delphini, *mediarum Borealiori conſiſtebat; triangulum verò æquilaterum cum illa in Capite & Roſtro* Cygni *conſtituebat. Altera verò illa Nova in* Pectore Cygni, *quæ rurſus, Anno* 1666. *illuxit, ſenſim creſcere videtur, quanquam necdum major eſt ſtellis* ſextæ *magnitudinis, ac minor adhuc illis tribus,* m, l, *&* k. *in* Collo *à me obſervatis. At illa in Collo* Ceti, *non maximè ſplendet; quippe* Secundæ *ferè magnitud. tum inſignis claritatis videtur.*

Ultimò, cùm heſterna die, (26. Auguſti) *optimam occaſionem nactus fuerim; cœlo admodum annuente, Teleſcopium illud,* 50. *pedes longum, quod non ita pridem mihi tranſmiſiſtis, ad ſidera adhibui, & quidem primo ad* Lunam; *inveni, quòd officio ſuo adeò ſatisfaciat, ut meritò habeam, cur vobis maximas agam gratias. Ad* Saturnum, *ut Luna fuerit præſens, ſatis ſuperque vires etiam ſuas extendit; ſiquidem faciem ejus nitidiſſimè ac clariſſimè detegebat. Quali autem mihi apparuit, adjecta delineatio (Vid. Tab.* 1. *Fig.* 2.) *commonſtrabit. Videbis* Saturnum *hoc tempore, altâ ſcil.* Aquila 24°. 32′. 0″. *in diſtantia ab extrema Alæ* Pegaſi 23°. 48′. 0″. *& ab Ore ejus* 24°. 51′. 40″. *in* 4°. 11′. Piſcium, *in* 1°. 53′. Latit. *Auſtr., in ipſa, nempe oppoſitione Solis exiſtente* Saturno, *planè alia* *facie, quàm Cl.* Hugenio, *tum* Vobis *Anno* 1666. *tum* Pariſienſibus 1668 *apparere. Siquidem* Annulus, *qui* Saturnum *circundat, multo nunc arctior, compreſſiorque animadverſus, quàm illo tempore, quaſi obliquiori, reſpectu Terræ, nunc viâ incedat. Non dubito, ſi Veſtrates illum nuper obſervarunt, quin eadem formâ iis quoque apparuerit; nam ſummâ diligentiâ illum adumbravi.*

Nomina Stellarum Cygni à Tychoni obſervatarum.

V.Tab.1. Figure 1.

	Magnit.
Roſtrum Cygni	3.
Nova Pectoris A.1603, à Keplero obſerv. 3 magn.	6.
Pectus	3.
Cauda	2.
In Ancone alæ Boreæ	3.
In Ancone alæ Auſtr.	3.
Extrema alæ Auſtr.	3.
In Capite	5.
In medio Colli	4.
Extrema & Suprema alæ Bor.	4.
Penultima ſ. Media	4.
Antepenultima ſ. infima alæ Bor.	4.
In Boreo pede præcedens	4.
ſequens	4.
In Auſtrali pede præcedens	4.
ſequens	4.
In principio alæ Auſtr.	4.
In vola alæ Auſtr. Bor.	4.
Media	4.
Infima	4.
In Cuſpide alæ Auſtr.	
Informium ſub ala Auſtr. Auſtralium præcedens	
ſequens	lit.
Duarum informium caput Cygni præcedentium inferior }	*b*
	num.
Supra Cuſpidem alæ Bor. Aquilæ Auſtr.	6.
Borealis	7.

Nomina

Nomina Stellarum Cygni à Joh. Hevelio Obſervatarum.

	Magn.	*Lit.*
Duarum informium, caput Cygni præcedentium, ſuperior.	6.	*c.*
Ad Genam Cygni	5.	*d.*
Nova ſub capite Cygni in via Lactea, trium ſuperiorum præcedens	3.	*a.*
Media	5.	*o.*
Ultima	5.	*p.*
Sub capite Cygni in via lactea ſub ipſo Tropico	5.	*r.*
Sub cap. duarum inferiorum ſup. Tropic. ſeq.	5.	*q.*
Infra lucidiorem Colli	5.	*n.*
Supra lucidiorem Colli trium præcedens	5.	*g.*
media	5.	*i.*
ſequens	5.	*m.*
Sub nova Pectoris prima	6.	*l.*
ſecunda	6.	*k.*
Informis in via Lactea præcedens collum	5.	*f.*
In Cuſpide alæ Vulturis	5.	*e.*
In ſuperiori parte Ventris præcedens	5.	*y.*
ſequens	5.	⸸.
Infima Ventris	5.	α.
In eductione Caudæ præcedens	5.	β.
ſequens	5.	γ.
In Extremitate Caudæ Borealis	5.	κ.
Auſtral.	6.	ζ.
Infra pedem Auſtrinum	5.	δ.
Infra Caudam informis	5.	ε.
Supra Caudam nebuloſa	6.	θ.
Supra ſagittam & ſub Tropico trium præcedentium	5.	ς.
media	6.	υ.
Supra ſagittam Auſtral. & proximior	6.	τ.
Supra ſagittam & ſub Tropico trium ſeq.	6.	χ.
Supra Delph., alam Auſtr. Cygni verſus, inferior & prima	5.	1.
ſecunda	6.	2.
Sub ipſo Tropico tertia	6.	3.
Supra Tropicum quarta	6.	4.
Ultima ſive quinta	6.	5.
Informium ſupra Delph., mediam ſub ipſo Tropico præced.	6.	9.
Informium ſupra Delphinum, inferiorem ſequens	6.	10
Sub Capite, *novam* [a] præcedens	6.	8.

An Accompt from Paris, *in two Letters to the Publiſher, dated July 5. and July* 19. 1670. *concerning the Earlier Diſcovery of the ſame* New Star, *which is deſcribed in the Precedent Letter.*

THe Letter of July 5. 1670. relateth, that a *Carthuſian* of *Dyon*, having from time to time for divers years taken particular notice of what might occur remarkable in the Conſtellations of *Cygnus* and *Caſſiopea*, did on the 20th of *December* A. 1669. diſcover a Star of the *Third* magnitude, beneath the Head of *Cygnus*, ſcituated in the Section of the two ſtraight lines, one of which goeth from *Lyra* to the neareſt of the Quadrangle in the *Dolphin*, and the other from the *Eagle* to the Star, which is on the top of the upper wing of *Cygnus*.

That of July 19. 1670. gives this Accompt, *viz. That* there was much diſcourſe at *Paris* about the *New Star* near the Beak of *Cygnus* firſt diſcover'd by a Carthuſian of *Dyon*, call'd *Antelme*, who ſent the news of it to M. L'Abbé *Mariotte*, one of the Royal Academy there, who had communicated it to the reſt: *That* they all agree, 'tis a *New* Star; though Monſ. *B.* oppoſed it at firſt, affirming it to be in *Bayerus*'s Tables. *That* they prove that Star in *Bayerus* to be another; giving, for diſtinguiſhment, theſe Meaſures.

The bright Star *ad Roſtrum Cygni* its Aſcenſio recta	289°.22'.0''.
Declinatio Borealis	27. 19.20.
But this *New* Star's Aſcenſio Recta is	293.33. 0.
Declinatio Borealis	26.33.20.
Longitudo	1. 55 ♒.
Latitudo	47. 28.10.
It's Diſt. from that ad *Roſtrum Cygni* towards *jaculum*	3. 47.

Some Communications, confirming the preſent Appearance of the Ring about Saturn, *by M.* Hugens de Zulechem *and Mr.* Hook.

THe *former* writeth in a Letter of his, dated at the *Hague* Octob. 31. 1670. ſt. n. That he obſerv'd *Saturn* with his Teleſcope of 22 feet, a little before he came out of *France*, which was the laſt Summer of this 1670. and ſaw his Figure to be very conform to what it ſhould be according to his *Hypotheſis*; *viz.* the *Anſæ* or Arms to be very narrow, inſomuch that their opening appear'd not but very obſcurely.

The *Latter* hath obſerved the ſame in *London*, Septemb. 16. ſt. v. as is repreſented in *Tab.* 1. *Fig.* 3.

An Extract out of a lately Printed Epiſtolary Addreſs, made to the G. Duke of Toſcany *touching ſome Anatomical Engagements, of* Laur. Bellini, *Ord. Anat. Prof. at Piſa.*

I Promiſe (ſaith that learned Anatomiſt) to give the whole Doctrine of *Reſpiration*, and to comprehend it in that order, that if I am not deceived in my own affair, the matter of the principal part of the Breaſt, and the whole Fabrick of the *Lungs* ſhall be made certain and evident, foraſmuch as all things do ſo aptly anſwer to one another, and are grounded upon Geometrical Principles. The ſum of it is this in the Authors own words.

Fuit in Aſperam Arteriam aer, momento compoſito ex gravitati & vi laterali, eaque Aeri, extrinſecus ſuperficiem pectoris circumprimenti, æquiponderat. Hinc muſculis Inſpiratoriis ſeſe contrahendi poteſtas permittitur; unde Coſtarum elevatio ac dilatatio, & aucta Pectoris amplitudo: Tum penitior Aeris irruptio, & expanſio ductuum pulmonarium; quod totum in Inſpiratione *contingit.*

Mox proprio pondere concidentibus ſupra tumidum Pulmonem coſtis, ſpatium Pectoris fit Anguſtius, & ipſarum ac diaphragmatis vi Pulmo comprimitur; Aerque partim per os extru-

ditur, partim ad minima uſque vaſcula adigitur, ſi quorum anguſtias penetrare proprio pondere non potuit; quouſque totus Pulmo detumeſcat, reſtitante ſolum in ejus veſiculis expanſa Aeris portione: quæ ſeries eſt Exſpirationis. *Hinc reſiſtentiæ minoris occurſu poteſt externus Aer rurſus irruere, eoque ordine, Reſpirationis opus peragere.*

Hæc autem ut evincantur, oſtendam prius, Muſculos pectoris non modò diſpoſitos ad leges Mechanicas, adeóque pro majori ſuperanda reſiſtentia validiores, pro minori debiliores, verùm etiam, quadam interioris Geometriæ peritiâ, ut ſeſe in Inſpiratione contrahentes, figuram Pectoris multò capaciorem efforment. Coſtas in Expiratione ex ſeipſis concidere, figuræ, poſitionis, atque articulationis beneficio: Diaphragmatis ac Muſculi Triangularis fabricam (quantum ex aliorum ſciam figuris, ac ſcriptis, nulli cognitam) nec non utriuſque uſum perſimilem; Ex quibus ea omnia evidenter conſtabunt.

Inſuper, Unum *eſſe* Uſum *Aeris in Pulmonibus, ut ſcil. à Capillaribus Vaſis Arteriæ pulmonariæ ad Capillaria Venæ Sanguinem adigat, ſeu ex uno ſinu cordis in alterum; atque in hoc tranſitu per pulmones ſanguinem ſolvi.*

Neque ita in Homine ſolum, verum hæc eadem etiam in Brutis *ita ſe habere moſtrabimus; & machinam in* Avium *coſtis perelegantem exponemus; quid porrò Vicarium Coſtis in* Teſtudinibus: *Idemque obtineri per* Aquam, *à* Piſcibus *ad bronchias expulſam, quod à cæteris per Aerem, pulmones explicantem.*

Hinc verò, quanta & quam facilis Propoſitionum ſeries, ad Pulmonum omnium figuras, ſuctus, vulnera, reſpirationes varias, mutatas, aut impeditas, in Aeris, Pulmonum aut Pectoris ſtatu diverſo: Quæ omnia quivis intelligat ex ſeipſo, dummodo id etiam ſuppoſuerit, Aerem æquo rariorem, & æquo denſiorem, Reſpirationi eſſe ineptum, & ſanguinis per pulmones excurſum prohibere.

Denique, ex iiſdem principiis deducam, probabiliter Fœtum in Utero non reſpirare; quod fortè etiam Geometricè demonſtrabo, ſi Diametros Arteriæ pulmonaris & Anaſtomoſis cum Arteria Magna comparare licuerit.

Addam his Opuſculum de Motu atque Uſu Bilis, *quorum alterum Geometricum eſt, alterum ex eo pendens, Obſervationibus illuſtrandum.*

illuſtrandum. Evincet illud, Fel *à Jecore & Veſicula ad inteſtina fluere; non è converſo: nec à Veſicula & Jecore in Cavam, ſpectatâ momentorum diverſitate, qua moventur fluida per contractiles & inæqualis amplitudinis tubulos. Unde conſtabit, Bilem è Veſicula elici non poſſe, niſi extrinſeca aliqua virtute comprimatur, quam ab adſtante & diſtento cibis Ventriculo petam; ſtatuens, Bilem in Veſicula ad digeſtionis tempus ſervari; ac tantum non evidenter oſtendens, per ipſam, tum temporis ad Duodenum fluentem, cibum à Ventriculo præparatum in Chylum faceſſere. Hinc ratio ſitûs Veſiculæ, Capſulæ communis in Jecore; cur item ductuum Felleorum aliquot in Veſicula deſinant; cur non-nulla Animalia eâdem deſtituta ſint, facile ex præcedentibus explicatur. Adhuc tamen obſervandus mihi ſitus Veſiculæ in quotquot occurrant Animalibus, præcipuè Carneo ventriculo præditis.* Pancreatis *etiam locum penſito, & humorem illius exprimi eodem, quo Bilis, tempore, deduco, ut ab utriſque permiſtis Chylus formetur.*

Erit hîc, Appendicis loco, Geometricum quiddam, demonſtrans, Quî fieri poſſit, ut in Veſica Urinaria generentur Conchylia ſpiralia, ſi per Ureteres exprimatur quid molle aut viſcidum, in Veſicæ reſiſtentiam incidens, eaque occaſione explicabitur, quo pacto in ſuperficie Terræ ſimilia intorta corpora poſſint produci, qualia in quibuſdam montibus obſervavi.

So far this Inquiſitive Anatomiſt, which the Publiſher (who very much doubteth, whether any Copies of this intimation, Printed at *Piſa* this very year, beſides that one, which lately came to his hands, be to be found in *England*) thought fit to inſert in theſe Papers, thereby to adminiſter occaſion to our dextrous Anatomiſts here, with all poſſible diligence and care to purſue, joyntly with that *Italian* Profeſſour, thoſe important Inquiries about ſuch conſiderable Subjects, as have been above related; comparing with their Reſearches in this matter the many notable Experiments, lately publiſhed in No. 63. and 64. of theſe Tracts, made and communicated by the Honourable *Robert Boyle.*

A Narrative of a Monſtrous Birth in Plymouth, *Octob.* 22. 1670; *together with the Anatomical Obſervations, taken thereupon by* William Durſton *Doctor in Phyſick, and communicated to Dr.* Tim. Clerk.

ONE, *Grace Batter'd*, the wife of a ſhoemaker, of honeſt Repute, and mother of five Children, now come to the full time to be delivered of a ſixth Birth, about twelve a Clock at night began to have travelling pains; and near four a Clock in the morning the Head of a Child came to the Birth: When the Midwife, putting her hand to help off this, felt another, (by its heat and motion) alive; and therefore made all poſſible ſpeed to deliver her of this.

'Tis obſervable, that in three of her former five travels ſhe was ſo quick, as that ſhe was deliver'd before the Midwife came; but now ſhe could not ſo ſpeedily effect her deſire, in regard that not only the firſt child was ſuffocated by its ſtay in the birth; but alſo the Head of the ſecond turning aſide from the inner orifice of the *Uterus* towards the groine, and the Twins being joyn'd together (as afterwards appeared) made it a different Birth. But the Midwife doing her part exceeding well, and the Mother having nimble travel, was delivered of thoſe prodigious Twins, the *effigies* of which is here ſent you incloſed, (See *Table* 2. *Figure* 1.) together with an Accompt of what we thought further worth obſervation.

This Birth, as you ſee, had two Heads, and two Necks, as alſo the Eyes, Mouths, and Ears, ſutably double. Four Arms with Hands, and as many Leggs and Feet. There was to both but one Trunk; but two Back-bones, from the *Clavicles* to the *Hypogaſtrium*, and from the ſhoulders down to the bottom of the Loins they were not diſtinct, but cemented and concorporated, after this manner: The right *Clavicle* or Channel-bone of the Right-hand-Child (being long) joyned with the left *Clavicle* of the Left-hand-Child. The Ribbs on the face-ſide of both of them, by the Cartilages or Griſtles were united without any intervening *Sternum* or Breſt-bone;

and ſo made a common Cheſt to them both: And the Ribbs of both on the Back-part were united by the Griſtles; and from the Clavicle down to the *Hypogaſtrium* or bottom of the Belly there, were ſo conjoyned, that they made but one common Belly, with one Navel-ſtring to them both; but from the *Hypogaſtrium* downwards they were divided, and became two, each having the perfect parts of Females.

Having with ſome difficulty obtained the Fathers leave to diſſect it, we firſt weighed this Birth; the weight whereof was *eight* pounds and a *quarter*; the Circumference of the left head was about *eleven* Inches, that of the right being half an Inch leſs. The Circumference of the Trunk was about *Sixteen* Inches and a *quarter*; and the length of both, from head to foot, was full *eighteen* inches and *an half*.

We found one Navil-vein, and one Liver, but that was very large, with the Bladder of Gall ſeated in its uſual place: but there were two Urinary Bladders, two Wombs, four Kidneys, and one Stomach, with the *Oeſophagus* or Gullet perforate and open from the Mouth of the left head; but the *Oeſophagus* from the Mouth of the right head deſcended no lower, than a little above half an inch off the Mid-riff and there it ended. No further could we follow it with the probe, but doubting a failure in that Experiment, we made an Eſſay with a Blow-pipe, and thereby we found, that the Wind would go no further than the place abovementioned. Whence it may be concluded, that the Right-handed-Child muſt have received its nouriſhment by and from the Left Child.

There was but one *Colon* or Colick gut, which terminated into two *Inteſtina recta*. So there was but one Midriff, and above that, we could find little or no appearance of Lungs; but only a very large Heart, (with two Auricles,) the figure of which was not Conical, but like a Souldiers *pera* or Snapſack, or the Ventricle or Stomach; and lying near under the Clavicles, tranſverſe, as the Stomach lyeth under the Midriff and Liver. We did alſo obſerve two Ventricles with the tricuſpid or ſigmoid-valves; as alſo the *Vena Cava* and *Aorta* dependant, and alſo the *Aorta* aſcending and bifurcate towards each neck, and then bifurcate again.

Theſe Twins were exactly like one another; very well featured, having alſo pretty neat and handſome Limbs. They had their hair more than ordinarily thick, and about half an Inch long, and the nails full grown.

We might have proceeded to further Obſervations, but time and the tumultuous concourſe of people, as alſo the night, and likewiſe the Fathers importunity to haſten the Birth to the Grave, hindred us.

The Mother is at this time in as good a Condition of Health, as Women in Child-bed uſe to be.

Obſervations on Inſects, lodging themſelves in Old Willows, Produced before the Royal Society *by Dr.* Edmund King, *July* 14. 1670.

YOu may remember, that about the *beginning* of *May* laſt, a piece of old Willow-wood, being ſent me from Sir *John Bernhard* out of *Northamptonſhire*, was produced before you; in which were lodged many Inſects curiouſly wrapt up in green Leaves, in ſeveral channels or burrows, each with 12. 14. or 16. leaves round the Body, and ſeveral of them with as many little round bites of leaves at each end, to ſtop them up cloſe. Theſe, thus made up, are near an Inch long or the beſt part of an inch, put in one after another into a bore made in the wood, fit for their reception. They are in the manner of Cartrages of Powder, wherewith Piſtols are wont to be Charged, or like long ſlugs of lead, as are ſometimes uſed in ſome parts of thoſe burrows; they are placed ſo near one another as to touch; in others, at ſome conſiderable diſtance. Theſe Inſects obſerve this method in placing themſelves, that ſometimes they make a direct way into the length of the wood, ſometimes they bore out into the ſide, and run another way, thoſe Channels being not unlike the burrows of Rabbets; all which they fill up with theſe round appearances of wrapt leaves, all regularly wrought: In which I find either ſomething alive, or appearances of ſomething that hath dyed there, and is putrified: In ſome a great number of Mites, of a dark aſh-colour, ſhap'd not unlike common Mites; in others, I find ſeeming excrements of ſome ſmall Inſect, with the decayed parts of the dead Inſect; in others, white Maggots, which you ſaw. Some of theſe Maggots I took out of their *Theca* or bagg, and put them in warm places in the Sun; and they thereupon grew ſomething bigger, but changed not ſhape nor colour, but dyed. The reſt I kept cloſe in a box till the eighth of *July* preſent: then I took one of them out of the wood, and open'd the leaves, and felt ſomething ſtir, hearing alſo an humming noiſe like that of a Bee; and as ſoon as I had open'd the *Theca*, a perfect Bee did fly out againſt my window, as ſtrongly as a common Bee out of an Hive, having much of the colour and bigneſſe of thoſe when they are new Flyers. Then being pleaſed at the ſight, I took five more (all I had left) and put them in a Box into my Pocket, to ſhew them the Lord *Brouncker*, before they were taken out, or had eaten their way out; but his Lordſhip not being at home, I brought them back again; and they being diſturbed, they all eat themſelves out; and coming home, they were all creeping about my Box, and are ſince dead there, and are theſe, I here preſent to your View. They have all ſtings as other Bees have. I had ſome thoughts at firſt ſight, by the yellowiſh Circles under their Bellies, that they might be a ſort of Waſps; but now am of opinion, that they are common Bees.

Extracts of two Letters, written by Francis Willoughby *Eſquire, to the Publiſher, from* Aſtrop, *Auguſt* 19*th and from* Midleton, *Sept.* 2*d.* 1670 *Containing his Obſervations on the Inſects and Cartrages, deſcribed in the precedent Accompt.*

1. I had the good luck to find a great many of your Cartrages in a rotten Willow; and, by the ſhape of the Maggot, was moſt confident, they would produce Inſects of the Bee-tribe. And this I ſhould moſt certainly have foretold you, had I ever received thoſe you ſent me by Mr. *Le Hunt*: But having only that one, you ſent me before, I was ſo fond and choice of it, that I durſt not open it. I think now, I have found out the whole myſtery; and if you pleaſe to ſend me Dr. *Kings* account, and one of your Bees, I may perhaps add ſomething; and ſhall be glad to be inſtructed in any thing, that hath eſcaped me. I deſire one of the Bees, becauſe all mine being of a late Hatch, and none of them yet turned into *Nympha's* (which is the word of Art for the *Aurelia* of a Bee,) I fear, I ſhall not ſee their laſt *Metamorphoſis* this year. In a Garden, near a Willow, I found, where they got their leaves for their Cartrages; which are not Willow but Roſe-leaves. I will now proceed no further.

2. At my coming home I found the long expected Cartrages, and ſome of the Bees hatched; ſo that now we want nothing to compleat their Hiſtory. I will trouble you only with thoſe particulars, that I find not mentioned in Dr. *Kings* paper, to whom we owe the knowledge of their productions, and whoſe obſervations concerning them our own experience hath ſince confirmed. Mr. *Snell*, an Ingenious Gentleman, brought of them to the Wells at Aſtrop, who directing me to the place where he got them, I there found great plenty in the Trunk of a dead Willow.

Beginning to unfold ſome of them, Mr. *Wray* immediately judged them to be made up of pieces of Roſe-leaves, and called to mind, that this very Spring a worthy friend of his, Mr. *Francis Jeſſop*, brought him a Roſe-leaf, out of which himſelf ſaw a Bee bite ſuch a piece, and fly away with it in her mouth. Whereupon ſearching the Roſe-trees thereabout, we found a great many leaves, with ſuch pieces bitten out of them, as theſe Cartrages are made up of; ſome of which I ſent you incloſed in my laſt. The *Cuniculi* or holes never croſs the grain of the Wood, excepting where the Bee comes in, and where they open one into another. From the place of entrance, they are wrought both upwards and downwards; ſo that ſometimes the Bee-maggot lyes under her food, and ſometimes above it. One end of the Cartrage, *viz.* that which is next the entrance, is alwaies a little concave; the other end, which is furtheſt from the entrance, a little convex, and is received into the concave of the next beyond it. The ſides of the Cartrages are made up of oblong pieces of leaves, and paſted together; the ends, of round ones: And where ever they do not lye cloſe one to another, the intermediate ſpace is filled up with a multitude of theſe little round pieces, laid one upon another.

The Cartrages contain a pap or batter, of the conſiſtence of a Gelly, or ſomething thicker; of a middle colour between Syrup of Violets and the Conſerve of red Roſes; of an acid taſte, and unpleaſant ſmell. In each of theſe, at the Concave end there lies one Bee-maggot, which feeds upon the forementioned matter, till it grows to its full bigneſs, and then makes, and encloſeth her ſelf in, a *Theca* or husk, of a dark-red colour, and ovall Figure; in which ſhe is changed into a Bee. The remainder of her food you may find dried into Powder at the Convex end; and her excrements at the Concave without the *Theca*.

The

The Bees, I found in your box (which are the only ones I have yet ſeen) were of a ſhorter and thicker ſhape, than the common Hony-bee, more hairy, &c. But the ſureſt mark to diſtinguiſh them, is, that the *forcipes* or teeth of theſe are bigger, broader, and ſtronger; in ſhape like thoſe of a Waſp or Hornet; from which ſhe alſo ſufficiently differs in having a tongue like a Bee, which *they* want.

They made their way out along the channel thorough all the intermediate cartrages, and not thorough the ſolid wood. Of the corruption of the matter within the Caſes, when the Bee-maggots or *Nymphæ* happen to miſcarry, are bred ~~little~~ Ant *Hexapods*, which produce Beetles; ~~two~~ Maggots, which produce Flyes; three Mites, *&c.*

From what hath been obſerved concerning this Bee, and by a great many more parallel Inſtances, we may anſwer the *Quære* of ſome, that have written of Bees, whether it be the Old Bee, or the Bee-maggot, that covers the Cells before the Change? And ſay, that it is the Maggot, and not the Old one. For, here the Old Bee, when ſhe hath left proviſion enough, with an Egge cloſes up the Cartrage; and hath no more to do: The Maggot a great while after making the *theca*, which is analogous to the cover of the Cells.

In Table 2; Figure II. repreſents the Leaf, out of which a long piece, as Figure III. and a round piece, as Figure IV, were bitten. Figure V. ſhews the Cartrage it ſelf; and Figure VI. the *theca*.

A Confirmation of what was formerly Printed in Numb. 50. *of theſe Tracts, about the manner of Spiders projecting their Threds; communicated by Mr.* John Wray, *to the Publiſher.*

Oncerning the manner of Spiders projecting their threads, I received the following account from Dr. *Hulſe*, from whom (to do him right) I muſt acknowledge, I had the firſt notice of this particular, which was not long after communicated to me by another Ingenious Friend, whoſe Letter I formerly ſent you to be imparted to the *R. Society*. Nor is it any great wonder, that Inquiſitive perſons, applying themſelves to obſerve and conſider the ſame Subjects, ſhould make the ſame diſcoveries.

I have (*ſaith he*) ſeen them ſhoot their webbs three yards long before they begin to ſayl; and then they will (as it were) fly away incredibly ſwift. Which *Phænomenon* doth ſomewhat puzle me, ſeeing oftentimes the Air doth not move a quarter ſo faſt as they ſeem to fly. Moſtly they project their threads ſingle, without dividing or forking at all to be ſeen in them: Sometimes they will ſhoot the thread upward, and will mount up with it in a line almoſt perpendicular; and at other times, they project it in a line parallel to the plain of the Horizon; as you may often ſee by their threads that run from one tree to another, and likewiſe in Chambers from one wall to another. I confeſs, this Obſervation at firſt made me think, that they could fly, becauſe I could not conceive, how a thread could be drawn ſo parallel to the Horizon between two Walls or Trees, as above-ſaid, unleſs the Spider flew through the Air in a ſtraight line. The way of forking their threads is expreſſed by the following Figure. (See *Tab.* 2. *Fig.* VII.) What reaſon ſhould be given of this dividing, I know not, except that their threads being thus winged, become better able to ſuſtain them in the Air.

They will often faſten their threads in ſeveral places to the things, they creep upon: The manner is, by beating their tayles againſt them as they creep along; which may be underſtood by this line. See *Tab.* 2. *Fig.* VIII. By this frequent beating in of their thread among the aſperities of the place, where they creep, they either ſecure it againſt the wind, that it be not eaſily blown away; or elſe, whilſt they hang by it, if one ſtick breaks, another holds faſt; ſo that they do not fall to the ground.

A Note Concerning the next foregoing Relation.

AFter we had received the precedent Confirmation touching the *firſt* obſerver of the *Darting of Spiders*, there came to hand a Letter from that Inquiſitive Gentleman, Mr. *Martin Liſter*, intimating, That if we were not yet fully ſatisfied about that matter, he had this further to ſay; that Mr. *Wray* knew nothing of his knowing it, no more than he (Mr. *Liſter*) knew, that either he or any body elſe knew it, untill ſuch time, as he occaſionally ſent him a Catalogue of our Engliſh Spiders: Upon which ſubject, in the next Letter, Mr. *Wray* put this among other queſtions to Mr. *Liſter*, whether he had obſerved the Darting of Spiders: To which he anſwer'd in the affirmative, relating to him many other circumſtances not obſerved by him before, ſo that he was deſired by M. *Wray*, to draw up his notes, and ſuffer him to preſent them to the *R. Society*: which he did. After which, the ſaid Notes were alſo publiſh'd, in *Numb.* 50. of theſe Books.

Whence it appears, that this Obſervation is as well Mr. *Liſters*, as Dr. *Hulſe's* (as is alſo acknowledged in the beginning of the precedent Account;) though it be true alſo, that when it was written and ſent by the former of thoſe two Gentlemen, it was not then a thing altogether unknown to Mr. *Wray*, but confirmed and enlarged by Mr. *Liſters* own

Obſervations. Which was thought fit to add here, that nothing might be detracted from Mr. *Liſter* for permitting his Notes in the lately mention'd Tract to be publiſhed as his own, which really they are.

An Accompt of ſome Books.

I. *DE CORPORUM AFFECTIONIBUS cum MANIFESTIS tum OCCULTIS, Libri Duo : Seu Promotæ per Experimenta Philoſophiæ Specimen. Auth.* J. B. Du Hamel, *Eccleſiæ Bajocenſis Cancellario.* Pariſiis, 1670. *in* 12°.

THe Learned Author of this Treatiſe having repreſented in the *Preface*, that the *Grecian* Philoſophy concerning Nature, hath been ſo far from being able to grow up any thing conſiderably, that by the more Generous and the more Intelligent men of this Age, it is eſteem'd rather to have degenerated and decayed ; giveth here a *Specimen* of Natural Philoſophy improved and advanced by Obſervations and Experiments ; not only endeavouring to explicate, from the Principles of the Modern Philoſophers, the Qualities and Powers of Bodies, but alſo giving an Accompt of the more notable Experiments, made in this Age in divers places, as *England, France, Italy*, *Germany*, *&c.* In the Performance of which he treats,

In his *Firſt* Book, of the Origine and Nature of Qualities in General ; then, of Heat and Cold ; of Fluidity and Firmneſs and other Tactile Qualities ; of Taſts, Smells, Sounds, Light, and Colours. In the *Second*, Of Medicaments in General ; then, of the Vertue and Uſe of Preparing, Alterative, Purgative, and Topical Medicines ; as alſo of Poyſons and Antidôtes. In the ſame, he proceeds to conſider Magnetiſme, Electricity, Gravity in general, and the Accelerated motion of Heavy Bodies : Concluding the whole with the conſideration of Librated Liquors, and the Weight of the Air.

All which is deliver'd not only with a ſingular brevity and plaineſs, but alſo with that ingenuity, that the Author every where candidly acknowledgeth, to whom he is chiefly obliged in theſe Eſſayes, alledging among the *Engliſh* Philoſophers moſt frequently and very honourably, the Noble *Robert Boyle*, and not forgetting the Illuſtrious *Bacon* and *Digby*, the Learned *Gilbert*, *Harvey*, *Gliſſon*, *Goddard*, *Merret*, *Willis*, *Hook*. Among the *French*; the famous *Gaſſendi*, *Des-Cartes*, *Paſcal*, *Fabry*, *Magnan*, *Du Clos*, *Morin*, *Petit*, *Cordemoy*: Among the *Italians*; the Excellent *Galilæo*, *Torricelli*, *Cabæus*, *Zucchius*, *Riccius*: Among the *Dutch*; the Curious *Otho de Geriok*, *Grimaldus*, *Bontius*, *Piſo*, *Walæus*, *Sylvius*, *Tachenius*, *Voſſius*: And among the *Danes*, the Learned *Eraſmus Bartolin*.

In the mentioning of which candour in our Author, we muſt yet take notice of one particular, alledged by the ſame, relating to that Honourable perſon, whoſe Writings he ſo often maketh uſe of (I mean Mr. *Boyle*:) Which is, That, when Mr. *Du Hamel* declareth p. 57. his diſſent from *him* in the Explication of the manner, how the World once framed, and the Courſe of Nature once eſtabliſhed, are preſerved, he underſtands him, who diſcourſes thereof in his Treatiſe of the *Origine of Forms and Qualities* p. 104. as if he excluded from the Generation and Growth of Living Creatures, the Creators *New* Concourſe; and eſteems, that to the admirable ſtructure of Animals, and the wonderfull variety, uſe and diſtinction of their Organs, there is more required, than can be accounted for by the Common Laws of motion. In anſwer to which, we deſire, it may be obſerved, that as M. *Du Hamel* declareth not for the neceſſity of a *particular* Concourſe of the Creator in the Phœnomena inſiſted on by him, ſo that judicious writer, whom he reflects upon, will not be found to deny that new Concourſe, pleaded for by *Du Hamel*; but rather, by aſſerting the *continued* general and ordinary ſupport and influence of the Firſt Cauſe implyeth that that preſervation and concourſe ever and conſtantly perpetuated is *ever new*, and conſequently keeps things in their priſtine ſtate and vigour, at leaſt ſo far, as the Creator did once determine they ſhould be kept. In ſhort, the Great Architect and Superintendent of the Univerſe, having once by a ſignal guidance contrived the Univerſal matter into the World, and particularly ſome portions of it into ſeminal Organs, and Principles, and ſetled the Laws, according to which the motions and actions of its parts upon one another ſhould be regulated, he doth now by his un-interrupted influence, preſerve the Powers and Operations of thoſe Principles or Springs by which they were by him once ſet a going.

II. *ELEMENTA PHYSICA, ſive Nova Philoſophiæ Principia; ubi Carteſianorum Principiorum falſitas oſtenditur, ipſiuſque errores ac paralogiſmi ad oculum demonſtrantur ac refutantur*, à Franciſco Wilhelmo *Libero Barone de* Nuland, *&c. Hagæ Comitis*, 1669. *in* 12°.

THough the Author of this ſmall Treatiſe, which came to our view by a particular friend, (our Stationers having as yet procured no Exemplars of it) lays down an *Hypotheſis* of Natural Philoſophy; yet will he not be underſtood to be *reſolved* to adhere unchangeably to it; but rather judges it more uſeful to employ great care and much time in obſerving the Effects of Nature; highly commending, for that method, the two lately founded Philoſophical Academies in *England* and *France*, which by Obſervations and Experiments, faithfully made, labour to attain the knowledge of Truth.

Concerning M *Des-Cartes*, though our Author declareth a high eſteem of his Ingenioſity, yet is he of opinion, that the fondneſs, which that great man had for his Syſteme of the World, and for the admirable Symmetry and congruity found therein, did ſo blind him, that he could not ſee his Errors in its contrivance. For, ſaith he, if he had but more attentively conſidered (for example) the nature of *Circular Motion*, he would never have found any *conatus* or endeavour in Bodies circularly moved to recede from the Center, but ſeen that that motion differed in nothing from another motion;(which he pretends to have demonſtrated,) and conſequently would not have ſuperſtructed ſo many things upon that endeavour, which, upon the overthrow of the foundation, muſt fall of themſelves.

To the Book is prefixed an Extract of a Letter of M. *Hugens*, declaring *firſt*, that the Diſpute touching the *Idea's*, and the proof of the Exiſtence of God by the way of *Des-Cartes*, is very obſcure. *Secondly*, that he (Monſieur *Hugens*) is of the opinion of this Author, in that he allows not *Solidity* or *Hardneſs* to be ſeparable from the nature of Body; which is repugnant to *Des-Cartes*, who maketh a Body to conſiſt only in *Extenſion*. And *Thirdly*, that in what *Des-Cartes* hath written of Motion, 'tis certain he did ſomewhat force himſelf, to avoid the condemnation of his Philoſophy at *Rome*, for having ſuppoſed the Earth to move.

In the Book it ſelf, is obſerved this Method: *Firſt*, the Author declareth, how of nothing all the Matter of the Univerſe hath been made and condenſed; ſhewing withall the nature and properties of Matter, and wherein it differs from Space or a *Vacuum*, and making it his buſineſs to reſtore to Philoſophy that *Vacuum*, which he judgeth to have been ungroundedly proſcribed by *Des-Cartes*, and which together with *Matter* is eſteemed by him to conſtitute all the diverſity and variety of Bodies in the whole Univerſe. *Next*, he teacheth, that the Form of the Univerſe conſiſts in its *Figure*, ſhewing, How of one and the ſame matter ſo many different things could be produced. *Then* he evinceth the Efficient Cauſe of the World to be a moſt Potent and Eternal Being, but by a proof different from that of *Des-Cartes*; and maketh it out, that that Being hath produced all the Bodies that are in the World by no other inſtrument,

ſtrument, but Motion ; whoſe Nature therefore and Laws he inveſtigateth, *viz.*

1. Two Equal Bodies, moved with *equal* celerity, if they meet one another, will reflect, without looſing any thing of their celerity.

2. Two Equal Bodies, moved with *unequal* celerity, if they meet one another, that which moveth more ſlowly, can give nothing of its celerity to the other.

3. Neither can that, which moveth with greater celerity, communicate its whole motion to the other.

4. If two Equal Bodies, moved with *unequal* celerity, meet one another, they will reflect ; and the motion which the Body, that moveth more ſwiftly, communicateth to the leſs ſwift, ſhall be to its whole motion, as celerity is to celerity.

5. If there be two Equal Bodies, whereof the one moveth infinitely ſwifter ; after their mutual encounter, that which moved more ſwiftly, ſhall be quieſcent, by communicating all its motion to the other.

6. If two Bodies be *unequal*, and the leſſer do move in that proportion, wherein the other exceeds it in bigneſs, they ſhall reflect after the encounter, ſo as to looſe no degree of celerity.

7. If two Bodies be to one another in any Proportion given, but the leſſer move infinitely ſwifter ; if the other be quieſcent, it ſhall impell it, how big ſoever it be.

8. If there be a proportion of Equality, the moved Body will be quieſcent by communicating its whole motion to the other.

9. But if that which is moved, be leſſer, it will be reflected looſing a part of its celerity, which it will impart to the other.

10. But if it be greater, it will move the ſame way, looſing alſo a part of its celerity, which the other will receive.

III. *A Diſcourſe of* LOCAL *MOTION*, *Engliſht out of* French. *London*, 1670. *in* 12°.

THis Diſcourſe undertaketh to demonſtrate the *Laws* of *Motion*, and withall to prove, that of the *Seven Rules* deliver'd by *Des-Cartes* on this Subject, he hath miſtaken *ſix*. In the doing of which, the Author particularly inſiſts on, conſidering the communication of Motion in *Percuſſions*; declaring, that, though this Subject hath been handled by very Eminent men, yet he taketh it otherwiſe in hand than they have done; foraſmuch as without making any particular *Hypotheſis*, he maketh it his buſineſs to ſearch into the very Sources of Nature, the Cauſes of all the Effects we find in Motions; and undertakes to give the demonſtrations of them. He is not ignorant of what hath been lately publiſh't by ſome famous Mathematicians of the Royal Academies of *London* and *Paris*. Neither doth he conteſt with thoſe perſons about that, which they pretend to, of having found the ſecret of the *Laws* of *Motion*. He only ſaith, that 'tis now three years that he gave abroad what he delivers in this Diſcourſe; and that, his Rules being compared with theirs, there may poſſibly be found conformity enough to make men believe, that he hath lighted together with them upon the truth, but that yet there will alſo be found difference enough, to make men judge, that he hath not learnt it from them. Beſides (*ſaith he*) they have done no more than meerly propoſed their Rules without proving them; whereas he undertaketh to *demonſtrate* all thoſe, he advanceth: Adding, that though M. *Hugens* hath given us hopes of publiſhing ſhortly a Book, wherein he will prove all his Rules, yet he dares affirm, that the *Hugenian* Method will be quite different from his, foraſmuch as he (M. *Hugens*) hath already explained himſelf ſufficiently, to give us to underſtand, that his demonſtrations are grounded upon particular *Hypotheſes*.

The chief Heads, explained in this Diſcourſe, are, That

1. A Body is in it ſelf indifferent to Reſt or Motion.
2. If a Body be once at Reſt, it will ever remain therein.
3. And if it be once in Motion, it continues to move alwayes.
4. That *Reſt* is not a meer Negation; and that there is as much Poſitive Action in Reſt, as in Motion.
5. The Bodies which we move, do ceaſe to move becauſe they are impeded.
6. A Body ſucceſſively receiving many Determinations, remains only affected with the laſt.
7. A free Body cannot be determin'd to move in a *Curve* line, nor with unequal celerity.
8. Every Body that moveth about a Center, endeavors to recede from it.
9. How a Body may be moved Circularly.
10. One Body moving againſt another Body gives it its whole Motion.
11. In the meeting of two Bodies there is made a Percuſſion which is mutual, and equally received in both.
12. A moving Body, meeting another Body that is Quieſcent, gives it all its Motion, and remains it ſelf moveleſs.
13. What is meant by *Abſolute* and *Reſpective* Velocity.
14. The Percuſſions are as the reſpective Velocities.
15. Two Bodies meeting one another, turn back, making an exchange of their Velocity.
16. Two Bodies moving toward the ſame places, continue after their encounter by exchanging their Velocities.
17. An hard Body coming to hit another Body that cannot be ſhaken, is reflected with its whole Motion.
18. The Angle of Reflection is equal to the Angle of Incidence.
19. It may be imagin'd, that the Oblique motion is compos'd of two Motions.
20. A general Rule of all Percuſſions.
21. There is alwaies equal quantity of *reſpective* motion.
22. The midſt of two Bodies is alwaies uniformly mov'd in a direct line.

23. All theſe Rules are true, whether the bodies be equal or unequal.
24. A body moveth in *pleno* as freely as in *vacuo*.
25. The Percuſſions of *equal* bodies are made in *pleno* as in *vacuo*. But when the bodies are *unequal*, the Percuſſions are made in *pleno* otherwiſe than in *vacuo*.
26. The Percuſſions of unequal bodies cannot be reduced to one General Rule.
27. Of Refraction.
28 An Appendix containing a Review of this Diſcourſe.

IV. *Congietture Phyſico-Aſtronomiche della Natura del Vniverſo, da* Pietro *M.* Cavina; *in Faenza*, 1669. *in* 4°.

THeſe Conjectures are raiſed by the Author upon ſome Celeſtial obſervations about the *Fixed* Stars at *Faenza*. The whole Tract conſiſts of three parts; Conſiderations, Obſervations, and Reflections.

In the *firſt*, this Writer taketh notice, 1. That men for many Ages have ſo much doted upon *Ariſtotle*, as to deny Faith to Senſe, and Proof to Experience. 2. That one of the received, and much contended for, *Ariſtotelian* opinions is that of the *Ingenerability* and *Incorruptibility* of the Celeſtial Bodies; but that Heaven it ſelf, impatient, as 'twere, to be ſo little known, hath generated *New* Stars, brighter than the known ones; thereby to ſtrike the eyes of men, that are curious and diligent in the inveſtigation of truths. And hence he proceeds to the

Second part, containing the *Obſervations* themſelves; whereby he affirms to have found conſiderable changes in divers of the *Fixed* Stars from what *Bayerus* and others have remarked of them, as to Magnitude and Number; inſtancing in *Vrſa* both *Minor* and *Major*, in the *Dragon*, *Cefeus*, *Bootes*, *Corona Septentrionalis*, *Hercules*, *Lyra*, *Cygnus*, *Caſſiopea*, *Perſeus*, and the *Via Lactea*.

Whereupon in the *third* part, having premiſed his method of obſerving and Meaſuring, he maketh theſe *Reflections*;

viz. 1. That the Stars of the *Firſt Magnitude*, their apparent Diameter being ſuppoſed to be 18″, and the Diameter of the Annual Orbe in the *Copernican* Hypotheſis being aſſerted, are at leaſt 71677713000 bigger than the Earth; and thoſe of the *Sixth Magnitude*, ſuppoſing their apparent Diameter to be 4″. 24‴, are 4378454048 times bigger, if *Ricciolo* have calculated aright in *Almag.* l.7. p.717. 2. That in the doctrine of the Earths Reſt, the Diſtance of the Fixt Stars is 100000 Semidiam. of the Earth; and, according to the *Copernican* Syſteme, 47439800 ſuch Semidiameters. 3. That, according to *Copernicus*, a ſtar of the *Second* magnitude cannot become of the *Firſt*, but it muſt grow 2562569939 bigger than the Earth, or approach nearer to the Earth by 1263841 Semidiameters of the Earth. 4. That in that part of Heaven, where one Star is grown bigger; another, not far off, is grown leſs, and *vice verſâ*; ſo that, if thoſe augmentations and diminutions could be exactly calculated, the ſums would be found equal.

From all which, the Author deduceth theſe Conjectures: 1. That the Heaven of the Fixt Stars is liquid 2. That it is Generable and Corruptible. 3. That the motion of the Earth is ſtill more improbable. 4. That theſe Variations of the Fixt Stars are Effects of the Sun; and that they are but moderately diſtant from the Sun. 5. That thoſe Stars are of a matter eaſily diſſipable; and like unto Lamps, which for want of aliment are extinguiſht, and by an acceſſion of aliment are magnified. 6. That all the Fixt Stars are in the Concave ſuperficies of their Heaven. 7. That both the Annual and Diurnal Motion of the Earth have no place, according to theſe Obſervations.

V. *Dimoſtratione Fiſico-Matematica delle ſette Propoſitioni, che promeſſe* Donato Roſetti. *In Firenze* 1668. *in* 4°.

These ſeven Propoſitions, which this Author pretends to have here demonſtrated, are theſe;

1. *What is the true Phyſical Cauſe of Equilibriums?*

2.*The Doctrine of* Archimedes, *importing, That a Floating body ſinks beneath the Level of the water ſo far, as that a maſs of water, equal to the part immerſed, doth abſolutely weigh as much as the whole floating Body; is falſe.*

3.*'Tis very probable, that there is no Æther, and that conſequently there is a vaſt* Vacuum.

4.*There is a very eaſy, ſhort, and infallible way, exactly to know how much is the abſolute weight of the Air, that is impendent over any particular place.*

5.*With little leſs eaſineſs and brevity, but with the ſame infallibility may be weighed any one part of the ſaid Air; for example, a Cubical foot.*

6.*The only way of meaſuring the height of the Atmoſphere.*

7.*How it may be experimented, whether* Light *at the diſtance of 40 or more miles be moved in any obſervable Time?*

Theſe Propoſitions have occaſioned very warm diſputes in *Italy*, where they were firſt ſtated; as may appear by what hath been publiſht againſt this Author by Signior *Montanari* and Signior *Finetti*, to which we muſt refer the *Reader*. We ſhall only take notice here, that the ſecond of theſe *Propoſitions* ſounding harſh, our Author, ſomewhat to mollify it, alledgeth, That he intends not at all to oppoſe the Doctrine of *Archimedes*, much leſs that of *Galileo*, concerning *Floating Bodies*; but that he would conſider every body equilibrated, and how far every thing retains its *Moment* in this Univerſe, (where we find the whole to gravitate,) in order to examine the *Torricellian* Experiment; which is to ſerve him for the main ground to weigh the Air, and to meaſure the Atmoſphere: In which caſe (*ſaith he*) the Floating Body, if it did abſolutely weigh as much, as the maſs of water, equal to its part immerſed, it would not make the Equal Sectors of that Sphere, which the Equilibrated Fluids do conſtitute, Equal in Moment.

ERRATA.

*Pag.*2083.*l.*29.*r.*Dimoſtratione.*ib.r.*da Dott.*p.*2090.*l.*8.*r.* Tychone.*p.* 2091. *l.* 19 *r.*5. 2.*p.*2093.*l.*25. *r.*gravitate. *p.*2095.*l.*22.*r.*monſtrabimus. *p.*2096. *l.*20.*r.*difficult birth *p.*2106.*l.*12.*r.*Gerick.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*, 1670.

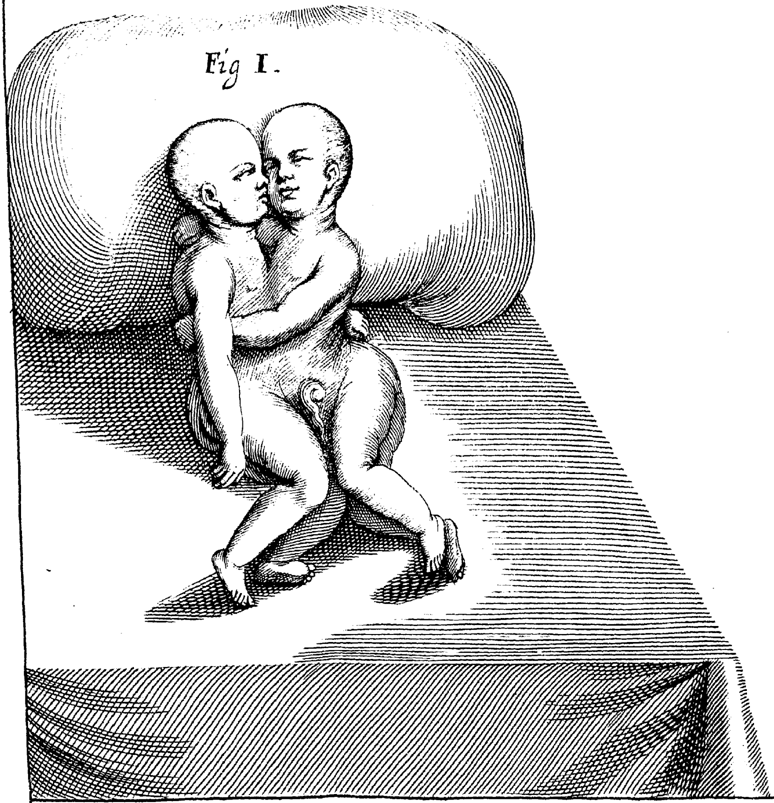
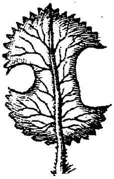
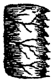


Fig I.

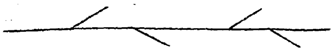

II

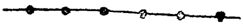

III

IV

V

VI


VII


VIII

Numb. 66

PHILOSOPHICAL TRANSACTIONS.

Decemb. 12. 1670.

The CONTENTS.

Extracts of two Letters, concerning a late Diſcovery of a Rock of Natural Salt in England. *An Accompt touching a way of reſtoring the Salubrity of the Country about* Rome, *applicable to other places. An Experiment of the Progreſs of* Artificial *Conglaciation, and the remarkable Accidents therein obſerv'd by the* Florentin *Philoſophers. An Extract of a Letter of M.* Hevelius, *concerning his Obſervations of a late* Eclipſe *of the* Moon, *a Conjunction of the* Moon *and* Venus; *as alſo ſome further remarks of two* New Stars, *&c. The Predictions of M.* Flamſtead *concerning ſome notable Obſcurations of divers Fixed Stars in the Year* 1671. *An Accompt of three Books.* I. *ORIGO FORMARUM & QUALITATUM, Auth.* Roberto Boyle*: now Printed in* Latin. II. *METALLOGRAPHIA, or an Hiſtory of Metals; by* John Webſter. III. *LETTERA di* Franciſco Redi *Sopra alcune Oppoſitioni fatte alle ſue Oſſervationi intorno alle VIPERE.*

Extracts of two Letters, written by the Ingenious Mr. Adam Martindale *to the Publiſher from* Rotherton *in* Cheſhire, *Novemb.* 12. *and Nov.* 26. 1670. *concerning the Diſcovery of a* Rock of Natural Salt *in that Country.*

A Gentleman of good account and reputation aſſures me, that in our County there is lately found out a great rarity, *viz.* a *Rock of Natural Salt*, from which iſſues a vigorous ſharp Brine, beyond any of the Springs made uſe of in our Salt-works; and this not nigh any River or great brook, as all our Salt-ſprings in this Country are, I ſhould ſcarce have adventur'd to write this to you, had I not believed, that this diſcovery might perhaps prove uſefull towards the filling up of ſome blank corner of a Page in the *Hiſtory* of *Nature.* However I am perſwaded, that ſuch Ingenuity, as poſſeſſeth the *R. Society*, cannot but pardon my boldneſs, ariſing from a zeal to ſerve ſuch Benefactors to Humane nature. And if you deſire to know any more particulars concerning this matter, a Letter of yours directed * * * ſhall command me to view the place, and there to inquire after the circumſtances, and communicate them to you, &c.

This being ſo acceptable an offer, the Author of the Letter was deſired accordingly, to give himſelf the trouble of viewing the place himſelf: Which deſire he not only hath very obligingly complied with, but alſo imparted what he learned in that view, as follows;

I am juſt now return'd from viſiting and viewing the Salt-work, and find things according to my Friends Relation: Only whereas I underſtood him, that no running water came near it, I now perceive, that he ſpoke of none that was conſiderable, or none that might annoy it. For there runs near it (at leaſt in the Winter ſeaſon) a ſmall rindle (or gutter rather;) but it is wholly free from all danger of overflowing; which threatens all other Salt-pits in this County, every great ſhower, through the vicinity of Rivers.

The Rock of Salt, by the relation of the Work-men, is between 33, and 34. yards diſtant from the Surface of the Earth; about 30 whereof are already digged; and they hope to be at the Flagg, which covers the Salt-rock, about three weeks hence. I doubt, it will be ſeveral months, before I can accommodate you with a parcel of it; that which the auger brought up, being long ſince diſpoſed of, and the work-men not daring to remove the Flagg, till the Frame be finiſh't and well ſetled for the ſecuring of the work from the circumjacent earth. The Overſeer hath promiſed to furniſh me with a piece of the Rock for your uſe; as alſo to ſignifie to me the time, when they intend to uncover it; that, if poſſible, we may make ſome ſuch Experiments, as you have intimated. That parcel of Natural Salt, which the inſtrument brought up, divers that ſaw it aſſure me, was as hard as *Allom*, and as pure; and when pulverized, became an Excellent, fine and ſharp Salt. The firſt diſcoverer of it was one *John Jackſon* of *Halton*, about *Lady-day* laſt, as he was ſearching for Coals on the behalf of the Lord of the Soil, *William Marbury* of *Marbury* Eſquire. This is all I can at preſent ſerve you in; only I am conſulting diligent and experienced perſons concerning the practiſe of the Agriculture of this Country, and hope ere long to give you ſuch an account as I can; though I cannot hope to diſcover any thing worth the notice of that truly *Royal Society*. It will be enough to ſatisfie my ambition, if I may but be continued in your thoughts as a Well-wiſher to ſuch Noble perſons and deſigns. In confidence whereof I ſubſcribe, &c.

An Accompt given by a Florentin Patrician, call'd Jo. Battiſta Donius, *concerning a way of reſtoring the Salubrity of the Country about* Rome*: Extracted out of the ninth* Italian Giornale de Letterati; *and Engliſh't as follows.*

THe Campagne of *Rome*, (which is that Tract of Land, that is deſtitute of Inhabitants and Trees, and extends it ſelf for many miles, taking in *Latium*, and part of the antient *Sabins*, and of *Tuſcany*,) would be of great uſe to the State, and of ſubſiſtence to the people, if it could be Inhabited without that great danger to health, which now 'tis ſo much noted and fear'd for; Phyſitians eſteeming, that from the Summer-Solſtice unto the Autumnal Equinox, the Air of it is ſo bad and noxious, that it would be great raſhneſs to dwell there: A malignity, which in former Ages it was free from, at leaſt, in that of *Cicero*, who, as appears by his Letters lived there in the Summer-months, went from one place to another, and return'd to *Rome*, without making mention of any ſuch danger. Wherefore that Country not being unwholeſome of its own Nature, but from adventitious cauſes, it is probable, that thoſe may be remov'd; as hath been propoſed by *Jo. Battiſta Donius*, in his Book *De Reſtituenda Salubritate Agri Romani*.

This Author having in the beginning deliver'd ſome Conſiderations touching the Air of *Rome*, and ſhew'd, that it never was, nor is, inſalubrious, as 'tis thought; proceeds to that of the Country *about* Rome, and

Firſt, deſcribes both the Antient and Preſent ſtate and diſpoſition of the Roman Campagne; noting the ſituation of many antient places; ſeveral particulars about the Greatneſs and Compaſs of the City of *Rome*, and the Number of its Inhabitants. *Juſtus Lipſius*, out of his great partiality to Old Rome, believed, there were in it four Millions of men; but this Author thinks it much, if there was ſo much as one Million.

Secondly, he examines the cauſes, which render this Roman Territory ſo unhealthfull; aſſigning them to be the Southern Winds reigning there; the many ſtanding Waters; the lowneſs of the ſhore; the inconſtancy of the Weather; and the exceſſive heat of the Summer.

Thirdly, he diſcourſes of the Remedies; eſteeming that, as the inſalubrity of that Campagne began only after it was waſted and diſpeopled, by the incurſions of thoſe Barbarous Nations, that invaded *Italy*, and deſtroyed the habitations that were there; ſo the Air would recover its former good temperature, if that Country were again Inhabited, and tilled as before. So that, *ſaith he*, thoſe Fields have no other noxiouſneſs from Nature, but the exceſs of heat and moiſture, and a ſudden change of Winds; things, which indeed are apt to incommode, but not to make extraordinarily ſick, much leſs kill the Inhabitants. And then, as to the evils that have been occaſion'd by mens negligence, he thinks it an eaſie thing to remove them; ſuch as are many ſtagnant waters, which he judgeth may be eaſily drained away into the neighbouring Rivers by means of Channels, neglected hitherto.

The greateſt evil are the *Pontin* Lakes, and all that flat ſhore of the Sea, whence the Sun extracts ſtore of noxious ſteams, which infect the Air, being diffuſed by the Southern winds through the neighbouring Country, eſpecially by the South-Eaſt-Winds, which traverſing the length of thoſe Lakes, raiſe and carry away with them peſtiferous vapors. This Evil the Author would remedy by draining thoſe grounds, and by letting into them running and live waters; as alſo by planting woods of Pine-trees, that ſhould cover that Campagne and Rome it ſelf from thoſe pernicious Lakes.

Which being done, he would have the Houſes for the new Inhabitants built on raiſed ground, cloſe joyned together in the forme of Caſtles, there being no better remedy againſt an ill Air than that of many Fires kept cloſe together. And here he adviſes, that the Churches, Granaries and Ammunition-houſes, and other high Buildings ſhould be raiſed toward the South, thereby to ſhelter ſuch Caſtles from the Winds that blow from that quarter. But above all things he recommends, that good and wholeſome Waters may be conveighed thither; a thing little leſs neceſſary for life than Air it ſelf: On which occaſion he giveth an accurate account of all the Fountains, Rivers, and other freſh Waters, that are to be found in that Campagne.

Having ſaid this, he declareth ſo great a confidence of his in theſe means well managed, that he is perſwaded, the Inhabitants would ſoon prove very numerous there, eſpecially if men were by the chief Governours of *Rome* encouraged with the conceſſion of great priviledges and with good uſage to ſettle in that place.

An

An Experiment Concerning the Progreſs *of* Artificial Conglaciation, *and the remarkable Accidents, therein obſerved by the* Florentin *Philoſophers, and publiſh't in their* Saggi di Naturali Eſperienze p. 147; *now Engliſh't for the further Tryal and Obſervation of the Curious here.*

THe firſt Veſſel, we uſed (*ſay thoſe Eminent Academiſts*) for this Experiment, was a Globe of Chryſtal, whoſe Diameter was $\frac{1}{8}$ of a *braccio**, with a long ſtreight neck of about a *braccio* and an half, graduated into ſmall parts. Having fill'd it with common water, up to the ſixth part of the neck, we put the Globular part into Ice and Salt, after the uſual manner of artificial Freezing of Liquors, and began very attentively to obſerve all the motions of the water, from its level. It was ſufficiently known before, that Freezing worketh in all Liquors a contraction; as alſo, that in the paſſage, which the water maketh from being ſimply cold to the leaving of its fluidity, and taking a conſiſtency and hardneſs by congelation, it not only returns to the bulk, it had before it was frozen, but ſwells to a bigger; ſince we ſee, that veſſels not only of glaſs but of mettal are forcibly broken thereby. But what might be the limits and period of theſe various alterations, which the Cold works therein, we as yet did not know; nor is it poſſible to attain that knowledge in opacous veſſels. We therefore, that we might not want that inſight, which appear'd to be the Soul of all theſe Experiments, had recourſe to Chryſtal and Glaſs, hoping that by the tranſparency of that body we ſhould be informed of the whole progreſs; in regard that at every motion, which ſhould appear in the water of the neck, we might quickly take the Globe out of the Ice, and therein obſerve the alterations correſpondent thereto. But the truth is, that we took more pains, than we can expreſs, before we could find out any thing certain touching the periods of theſe accidents.

**Which is near three Engliſh Inches.*

And to deliver more diſtinctly the ſucceſs, you are to know, that in the firſt immerſion of the Globe, as ſoon as it touched the Icy water, there was obſerved in the water of the Glaſſes-neck a ſmall riſing, but that ſufficiently quick; after which, with a motion regular enough, and of middle velocity, it retired back to the Globe, till being come to a certain mark, it continued not to deſcend any further, but ſtopp'd there for a while, being altogether, as far as we could ſee, moveleſs. Afterwards, little by little it was ſeen to begin to riſe again, but with a very ſlow motion, which was in appearance even and regular; from whence, without any proportioned acceleration, it ſuddenly and furiouſly ſtarted upwards; in which time it was impoſſible to follow it with our eyes, it running up with this impetuouſneſs, in an inſtant, as 'twere, through ſeveral tens of the marked degrees. And as this violence began in a moment, ſo in a moment it ended; foraſmuch as from this very great velocity it ſuddenly paſſed to another degree of motion, which though nimble enough, was yet incomparably leſs than the precedent; and going on to riſe in this degree, it went to the top of the next, and at laſt run over.

All the while, that theſe things happen'd, there were at times ſeen on the top of the water ſome bubbles, either Aereal, or of another more ſubtile matter, now in a greater, then in a leſſer plenty: And this ſeparation did not begin till the water had begun to take a briſk cold; as if the force of ſuch a cold had the power of ſtraining ſuch matter, and ſevering it from the water.

Now being deſirous to ſee, whether thoſe alterations kept among themſelves any kind of Analogy, we began to reiterate the conglaciations, and no ſooner was one Ice deſtroyed, but we ſet it to freeze anew: And the water went to congele again in the ſame order of alterations; which yet did not every time return to the ſelf ſame points or degrees in the neck: Which made us believe, that they had no conſtant and ſtable period, as reaſon ſeemed to perſwade us they had. Mean time it fell out in repeating theſe Experiments, that having once unawares let the water of the Globe freeze near to the neck, the Globe burſt: Whereupon another being taken of a leſs ſize, to the end that the Cold might more ſpeedily and more eaſily get into all the water, and the neck of it being two *braccia's* long, that it might not run out; it was filled with water up to the 160th degree, and then put into the Ice. Here obſerving it with the beſt attention we could, we found *firſt*, that all the accidents of ſubſiding, riſing, reſting, ſtarting upwards, running, retarding, did alwayes follow in the ſame points of the neck of the Globe, that is, when the ſurface of the water ſtood at the ſame degrees; provided, that in the act of ſetting it in the Ice, care were taken, to put it to the very ſame degree, where it was, when put into the Ice the time before, that is to ſay, to the ſame temper of heat and cold: In which caſe the whole veſſel might be conſider'd as a very nice Thermometer, by reaſon of the great capacity of the Globe, and the exceeding ſtreightneſs of the Neck. This being provided for, we began to take notice of the preciſe time of Congelation; which to find aright, we did after every little ſpace of time take up the Globe out of the Ice; but how frequently ſoever we made ſuch obſervations, we never could ſo hit it, as to ſee even the leaſt veine of froſt, but alwayes it was either all fluid, or all frozen. Whence we conjectured, that the work of Congelation was done in a very ſhort time, and that he, who ſhould with taking pains have the luck to take the Globe out of the Ice in that nick of time, when the water ſhould receive that ſo ſudden change, would certainly find ſome thing very notable thereby. And becauſe by the ſo often taking out and putting the Globe into the Ice, the whole period of its changes was diſordered; we let it return to juſt the ſame mark as it was at firſt, and then placing it into the Ice, we fixed it to that degree, in which it was wont to take that very impetuous motion, and half a degree before it arrived thereto, we took it out. Then looking conſtantly with a carefull eye upon the water in the Globe, which by reaſon of the tranſparency of the Chryſtal was plainly ſeen to be yet altogether fluid and clear, the water, though now out of the Ice, did by the operation of the introduced cold, (after it had attained to its due point with a ſwiftneſs imperceptible to the Eye, the tranſparency within the Globular part being loſt, and it ſelf in an inſtant, as 'twere, deprived of its motion) totally conglaciate. Which Experiment we tried over and over again, and found it alwayes ſucceed alike.

An Extract of a Letter of Monſieur Hevelius, *concerning his Obſervations of the* Moon's Eclipſe, *on* Septemb. 29. *ſt n.* 1670. *and the* Conjunction *of* Venus *and the* Moon, *on the* 11*th of* Octob. *ſt. n.* 1670; *as alſo ſome remarks about the* New Star *near the* Beak *of the* Swan, *and that other in the* Neck *of the* Whale: *together with ſome other particulars of a Philoſ. nature. Here deliver'd in the ſame Tongue, in which it was written.*

NOn potui Reſponſum tuum ad meas ultimas exſpectare, quin rurſus ad Vos ſcriberem, deque recentioribus quibuſdam* Phœnomenis *& Obſervationibus, hîc à me feliciter habitis, certiores redderem; inprimis cum videam, meas quales quales Animadverſiones Cæleſtes Illuſtriſſimæ noſtræ* Societati Regiæ *hactenus non omninò diſplicuiſſe.*

Primò, *die* 29. Septembris *ſt. nov. mane,* Eclipſin Lunæ *Cœlo perquam ſereno, ab initio uſque ad finem, ex voto obſervavi. Initium ejus incidit hora* 2. 22′; *quanquam id ipſum vix omnino accuratè obſervari potuerit, ob Umbram Terræ dilutiſſimam: Siquidem, durante Eclipſi, tota Umbra adeò tenuis erat atque diluta, ut omnes præcipuas maculas per eam, meo viginti pedum Tubo, quin & brevioribus optime conſpicere potuerim.*

Maxima ejus Obſcuratio incidit hor. 3. 50'. Finis verò h. 5. 21'. Tota itaque Duratio fuit hor 2. 59'; & Quantitas vix amplius 9 digitorum. Quibus verò Tabulis, *Eclipſeos hujus Obſervatio accuratius reſpondeat, Vos Judicabitis. Juxta* Rudolphinas *hîc Gedani incidit;*

	h.		hor.
Initium	2.37'.5''.	*Secundum Riccioli Tab. Initium*	2.14'.47''.
Max. Obſc.	4. 2. 50.	*Max. Obſcur.*	3.55.37.
Finis	5.28. 33.	*Finis*	5.36.27.
Tota dur.	2.51. 30.	*Tota duratio*	3.21.40.
	dig.		
Quantitas	9. 4. 0.	*Quantitas digit.*	11 43. 0.

Circa Medium hujus Eclipſis hor. 3. 40'. Stellulam quandam incognitam, ac ſolo Tubo conſpicuam, à Luna circa Lacum nigrum Majorem *tectam, clariſſimè conſpexi; ſed exire eam non deprehendi. Deinde, finitâ Eclipſi, jucundiſſimum quoque obſervatu erat, bina Luminaria ſimul ſupra Horizontem videre. Nam priuſquam Luna occideret, Sol oriebatur. Cætera notatu digna ex particulari hoc Typo deprehendetis.*

Ordo

Ordo Phaſium	Phaſis Lunæ Teleſcopio Obſervata.	Altitudines	Tempora ex Altitudinibus Correct.	Animadvertenda.
		Caudæ Cygni 50°.54.	hor. 12. 8'.34".	
		Caudæ Cygni 50. 25.	12.11.32.	
		Pollucis ♊ 26. 39.	1.28.56.	
		Pollucis ♊ 27. 16.	1.33.17.	
	Penumb. init.		2.10. 0.	
	Initium Eclip.		2.22. 0.	Cœpit Eclipſ. in part. ☽ a ſup. circa ſin. hyperb.
1	$1\frac{1}{8}$ dig.		2.31. 0.	Umbra ſinũ Apollinem & M. Porphyr. ſtring.
2	$2\frac{1}{4}$		2.36. 0.	Lacus niger major tegi incipiebat.
3	$3\frac{1}{4}$		2.41.40.	Umbra ad Inſ. Corſicam pervenerat.
4	$3\frac{3}{4}$ paulo plus		2.45.50.	
5	$4\frac{3}{8}$		2.49. 0.	Pal. Mæotis & M. Ætna plane tectus.
6	5 dig. fere		2.53. 0.	
7	$5\frac{3}{4}$		2.57. 0.	Inſ. Besbic. & Inſ. Macra tecta.
8	6 dig.		3. 3. 0.	
9	$6\frac{1}{4}$		3. 5. 0.	
10	$6\frac{3}{4}$		3. 8.30.	Inſ. Melos tegi incipiebat.
11	$7\frac{1}{8}$		3.11. 0.	
12	$7\frac{5}{8}$		3.16. 0.	Inſ. Rhodus tecta.
13	$7\frac{7}{8}$		3.20. 0.	
14	$8\frac{1}{4}$		3.25.30.	
15	$8\frac{1}{2}$		3.29. 0.	Inſ. major Caſpii tegebatur.
16	$8\frac{3}{4}$		3.33.40.	
17	$8\frac{7}{8}$		3.37.50.	
			3.40. 0.	
18	9 dig.		3.47. 0.	Max. Obſc. per J. Leto. & M. Aber. ſe exten.
19	9 paulo min.		3.51.10.	Pal. Maræotis ſub umbræ ſectione ſubſiſteb.
20	$8\frac{3}{4}$		3.57. 0.	
21	$8\frac{1}{2}$		4. 1.40.	
22	$8\frac{1}{4}$ fere		4. 6. 0.	
		Polluc. ♊ 49°.50'.	4.10.28.	
23	8 paul. plus		4.11. 0.	Inſ. Melos & Rhodus umbrâ exiverant.
24	$7\frac{3}{4}$		4.17.20.	
25	$7\frac{3}{8}$		4.22.25	M. Porphyrites illuſtrari incipiebat.
26	$6\frac{3}{4}$		4.27.35	Umbra M. Ætnam jam reliquerat.
27	$6\frac{1}{4}$ fere		4.33.40	
28	$5\frac{1}{4}$		4.37.37	
29	$4\frac{3}{4}$		4.44.46.	
30	4 dig.		4.50.56.	M. Argentar. & Inſ. Besbic. illuſtrabantur
31	$3\frac{3}{8}$		4.54. 0.	
32	$2\frac{3}{4}$		4.57. 0.	
33	$2\frac{1}{4}$ fere		5. 1.23.	Umbra totam fere I. Caſpiam maj. tranſierat.
34	$1\frac{5}{8}$		5. 4.45.	
35	$1\frac{1}{4}$ dig.		5. 7.43.	
		Cordis ♌ 25°. 4'8.	5.10.50.	
	Finis Eclip.		5.21.25.	Fines circa Riphæi montes contigit.
	Penumb. finis		5.24. 0.	
		Sirii 18°. 54'.	5.28.32.	

p. 2

Secundo; *die* 11 Octob. *ſt. n. incidit mane, poſt Solis ortum, horâ circiter octavâ, hîc* Gedani, *Conjunctio* Veneris *&* Lunæ, *quam Calculus Rudophinus pariter eodem fere tempore indigitavit; quo videl.* Luna *parte ſuâ inferiori* Venerem *occultare ad 23″ minimum debebat. Ad quod rariſſimum ſpectaculum obſervandum me* Tubo 20. *pedes longo accinxeram. Atque quamvis Aer non omnino eſſet defæcatus, nubeſque rariuſculæ hinc inde obvolitarent, Sole pariter jam orto, nihilominus &* Lunam *&* Venerem *clariſſimè conſpeximus, ad horam uſque decimam; imò diutius potuiſſemus, ſi fuiſſet opus: Sed à* Luna, *ut ut* Tabulæ *dictæ Occultationem illam penitus confirmabant, Venus tamen nequaquam tecta fuit, ſed aberat* hæc, *circa veram ſcil. Conjunctionem, à Limbo* Lunæ *inferiori ad* 4, *vel, minimum,* 3. *minuta; ſic ut nulla eo tempore Occultatio, ſed tantum arctus Tranſitus extiterit. Volupe profecto erat jucundiſſimum illud Spectaculum, de die, Soleque ſplendente, adeò diſtinctè ac dilucidè contemplari.* Luna *namque erat tenuiſſima, ad* Conjunctionem *propendens, valdeque* Corniculata: *At* Venus *propemodum plena, & corpore valdè diminuto. Si non adeò vaporoſus fuiſſet Aer, frequentius accuratiuſque diſtantias* Veneris *&* Lunæ *à* Jove, *aliiſve quibuſdam Fixis cepiſſem; ut jam non niſi eas, quas mitto, obſervare licuerit. Horâ* 7. 40′. *eo ipſo die tres* Parelii *apparuerunt. Quid Vos hiſce de rebus deprehendiſtis: primâ occaſione exſpecto.*

Tranſitus

Tranſitus Lunæ Supra Venerem, Ao. 1670.

die 11 Octob. ſt. n. Obſervatus.

GEDANI

A

Johanno Hevelio.

Juxt. hor. amb. mane.				*Diſtantiæ & Altitudines.*	*Tempus ex altitud. Correct.*
Hor.	*'.*	*".*		°. '. ".	*Hor.* '. ".
3	47	20	*Altitudo Lucidæ* ♈	41. 45. 0	3. 54. 10
3	50	35	*Eadem altitudo*	41. 11 0	3. 57. 28
5	47	44	*Diſtantia* ♀ *in* ♃.		5. 54. 44
5	48	35	*Diſt.* ☽ *limb. orient. à* ♃	35. 25. 30	5. 55. 35
5	51	59	*Diſt.* ♀ *à* ♃.	35. 50. 0	5. 59. 0
5	53	40	*Diſt.* ☽ *limb. orient. à* ♃.	35. 29. 10	6. 0. 40
6	12	30	*Diſt.* ♀ *à* ♃.	35. 50. 20	6. 6. 0
6	14	3	*Diſt.* ☽ *limb. orient. à* ♃.	35. 37. 35	6. 8. 0
6	37	0	*Diſtit.* ♀ *à* ☽, *quantum nudo oculo dijudicari potuit.*	6. 0	6. 51. 0
				5. 0	7. 7. 0
7	12	0	*Diſt.* ♀ *à* ☽ *limbo infer.*		
7	17	0	*Diſtit.* ♀ *à* ☽, *limb infer.*	4. 0	7. 12. 0
7	35	0	*Venus clarè apparuit, ſed Luna non ampl. ob nubec*		7. 30. 0
7	45	0	*Venus; ſimul tres* Parelii *apparuerunt.*		7 40. 0
9	11	0	*Venus permanſit conſpicua.*		9. 12. 0
9	15	48	*Altitudo Solis.*	19. 8. 0	9. 17. 20
9	17	39	*Altitudo Solis.*	19. 58. 0	9. 19. 4

Tertio, *Nova illa Stella ſub* Capite Cygni, *quæ initio* Tertiæ *videbatur* Magnitudinis, *mirum in modum Menſe* Septembri *decrevit, adeò ut* 14. Octobris *nullâ ratione amplius* Sextante *obſervari à me potuerit; licèt omnem adhibuerim diligentiam. Nam vix ac ne vix quidem nudo oculo animadverti potuit; adeò ut ab hac die illam amplius non viderim, ut ut ſingulis diebus Cælo ſereniſſimo omnes oculorum nervos ad eam intenderim. Altera verò* Nova *in* Collo Ceti *ad medium uſque menſis* Octobris, *Mandibulæ* Ceti *æqualis ferè extitit magnitudine, & claritate eam propemodum ſuperavit; adeò ut hoc Anno* Secundæ *fuerit magnitudinis, ac major quàm præcedentibus annis, excepto Anno* 1660, *quo major etiam* Mandibulâ Ceti *à me fuit deprehenſa. Aliis temporibus non memini eam* Tertiæ *Magnitudinis Stellas ſuperaſſe. Certum igitur eſt, ipſam non eandem ſemper præ ſe ferre Magnitudinem nec claritatem, ut ut in maximo ſuo exiſtat incremento: heſternâ verò die multum decreverat.*

Quod reſtat, Lentem illam Domini Burattini pro Tubo 70. pedum elaboratam necdum explorare licuit. Idem promiſit aliam multò longiorem, pedum ſcil. 140; *quam ubi accepero, illarum vires ſimul explorabo, Voſque deinde de omnibus & ſingulis certiores reddam.*

Succinum, *quod ſigillo cedit (de quo ante hac) inter omnium rariſſima quæ apud nos reperiuntur, meritò habetur; quippe dum vixi, ſi bina illa fruſta, quæ penes me habeo, excipias, ne unquam quidem vel minimum fruſtulum vidi, ut ut tale à multis annis ſollicitè quæſiverim. Interim ut Illuſtriſſimæ* Societati *promptitudinem meam declarem, illi ex binis illis fruſtulis, quæ penes me ſunt, alterum proximo vere navi quadam tranſmittam; terrâ quippe id fieri nequit ſi faciem, figuram, atque inſignia impreſſa omnino retinere debeat. An unquam fruſtulum, altera parte molle, alterâ duriſſimum poſſim impetrare, valde dubito.*

In Machina mea Cæleſti alacriter & conſtanter, quantum occupationes aliæ unquam permittunt pergo. Valete & porro favete veſtro Conſodali, Illuſtriſſimæ Societati R. *devinctiſſimo* Joh. Hevelio. *Dabam* Dantiſci 1670. D. 31. *Octobris.*

Lunæ

Lunæ ad Fixas Saturnumque,

Anno 1671.

Appulſus obſervabiles, prædicti, & ad Meridianum Latitudinemque *Londini* accurate ſupputati à *Joh. Flamſteadio* Derbienſi-Anglo.

ANno 1671. Januarii 4°. *Luna appellit ad ſtellam in altero flexu Auſtrali aquæ* Aquarii, *Magn.* 5. *cujus long.* ♓ 12°. 18′. *Lat.* 2°. 49′. *Auſtr.*

Londini, hujus occultationis,

	h. ′ ″			′ ″	
Initium	6. 57. 10	*Lat* $\ast^{a}$ *à centro*	*Ingr.*	15. 05	*Auſtr.*
Finis	7. 14. 22	*Lunæ in*	*Emerſ.*	16. 51	
Mora	0. 17. 12				

2. Febr. 13. *poſt mediam noctem ſequentem celebratur appulſus Lunæ ad ſtellam honoris* 4. *quæ vocatur Borealis trium ſub ventre* ♍; *cujus Long.* ♍ 9°. 53′. 5″. *Lat.* 1°. 20′. 30″. *Auſtr.*

Londini, Stellæ dictæ,

	h.				
Immerſ.	14°. 24′. 45″.	*Lat.* $\ast^{a}$ *à centro*	*Immerſ.*	7′. 05″	*Auſt.*
Emerſ.	15. 30. 54.	*Lunæ in*	*Emerſ.*	1. 20	
Mora ſub ☽^{a}.	1. 06. 09.				

h.

3. Mart. 4. 8. 46'. *p. m. ſecundum* Wingi *Ephemerides Luna congreditur cum Media trium in cauda* Arietis, *cujus eo tempore long.* ♉ 17°. 19'. 8". *Lat. Sept.* 2°. 50".

Londini,

	h.			
Subingr.	10. 14'. 52".	*Lat. Stellæ à centro* ☽*æ in*	*Immerſ.*	16'. 07".
Detectio ✳*æ*	10. 31. 13.		*Emerſ.*	15. 39.
Mora ſub ☽*a.*	0. 16. 21.	*Max. appropinquatio centror.*		15. 53.

4. April. 12. *alterâ horâ poſt occaſum Solis Luna appellit ad* Spicam Virginis, 1*æ Magnit.*

	Londini, h.	*Derbiæ.* h.			*Lond.* ′ ″	*Derb.* ′ ″
Subing.	9.05'.53"	9.01'.00"	*Lat.* ✳ *à centro* ☽*æ in*	*Immerſ.*	3.08	2.39 *A.*
Emerſ.	10.20.35	10.13.45		*Emerſ.*	4.33	4.48 *B.*
Mora	1.14.41	1.12.39				

5. Maii 6. *Luna, poſt occaſum Solis, Borealem trium ſub ventre* ♍ *(magn. 4tæ) cooperiet: Cujus Long.* ♍ 9°. 53'. *Latit.* 1°. 20'. *Bor.*

Londini Stellæ,

	h.				
Subingr.	9. 09'. 37"	*Lat. à centro* ☽*æ in*	*Subingr.*	1'. 54".	*Bor.*
Emerſ.	10. 14. 56		*Emerſ.*	8. 10.	
Mora.	1. 5. 19				

6. Maii 21. *Saturno Cynthia jungitur poſt mediam noctem ſequentem.*

Londini centri Saturni

In-

h.

Ingreſſus 14. 29′. 17″. } *Lat.* ♄ *à centro* { *Immerſ.* 8′. 52″. }
Emerſio 15. 31. 23. } ☽*æ in* { *Emerſ.* 4. 27. } *Bor.*
Mora ſub ☽*æ*. 1. 02. 06. }

h.

7. Julii 17. 13. 8′. *Luna, Authore* Wingo, *cum Stella*, *5ti honoris dicta, in Lino Boreo* ♓*um à Connexu præcedens: ejus tunc temporis locus* ♈ 23°. 7′. 26″. *lat.* 1°. 38½ Bor.

Londini ſtellæ cum Luna

h.

Congreſſio 12. 8. 32. } *Lat. à centro* ☽*æ* { *Immerſ.* 14′. 50″.
Sejunctio 12. 52. 21. } *ad Boream in* { *Emerſ.* 12. 10.
Mora ſub ea 0. 43. 49. }

h.

8. Septemb. 9. 10. 54′. *Luna juxta Ephemerides cum ſtella Lucis 4tæ in Lino Auſtrali* ♓*um lucidiorum trium media, cujus long.* ♈ 12°. 53′. *lat.* 1°. 5½. *Bor.*

Londini Occultationis

h.

Initium 10. 23′. 48″. } *Stellæ à centro* ☽*æ* { *Immerſ.* 15′. 20″.
Finis 10. 59. 33. } *Lat. ad Bor. in* { *Emerſ.* 11. 11.
Duratio 0. 35. 45. }

9. Octob. 9. *poſt mediam noctem ſequentem*, *Luna ad* Pleiadas *appellit, quarum loca ad inſtans tempus proveniunt.*

	long.	lat.	magn.
Occidentalis lucidior ♉	24°. 41′. 48″.	4°. 9′. 40″.	5.
Occidentalis Borealior	24. 52. 07.	4. 31. 36.	6.
Infima occidentali proxima	24. 58. 37.	3. 53. 30.	6.
Sequens Borealior	24. 59. 07.	4. 23. 56.	6.
Media & lucida	25. 19. 37.	4. 00. 00.	3.
Quæ eſt in cuſpide ad ortum	25. 45. 07.	3. 51. 20.	5.
Orientalium ſuperior	25. 45. 07.	3. 54. 00.	7.

Occidentalis lucidioris inter Pleiades

	h.			
Immerſ.	16.15'.13''.	*Lat. à centro* ☽*æ*	*Ingreſſu*	1'. 22''.
Emerſ.	17.21.20.	*ad Bor. in*	*Egreſſu*	2. 15.
Mora.	1.06.07.			

Mediam & Lucidam Pleiadum Luna nobis

	h.			
Subducit	17.33.07''.	*Lat. lucidæ à centro* ☽*æ ad Auſtr. in*	*Ingr.*	7'.16''.
Retegit	18.29.23		*Emerſ.*	6.37.
Detinet	0.56.16			

Infimam occidentali proximam Luna.

	h.			
Attingit	17. 4'. 36''.	*Lat.* * *à* ☽*a ad Auſtr. in*	*Ingreſſu*	14'. 07''.
Detegit	17. 40. 34.		*Emerſ.*	13. 40.
Retinet	0. 35. 48.			

Succedit autem quæque Phaſis alteri hoc ordine:
Octobris 10*mo mane.*

Phaſ.	h. ' ''	
1	4.15.13.	*Luna Occidentalem lucidiorem attingit.*
2	5.04.36.	*infimam occidentali proximam obſidet.*
3	5.21.20.	*occidentalis lucidior emergit.*
4	5.33.07.	*media & lucida luce nobis capta eſt.*
5	5.40.34.	*infima occidentali proxima evadit.*
6	6.29.23.	*media & lucida Pleiadum remittitur.*

Novemb. 3. *ineunte nocte Luna iterum Mediam in Lino Auſtrali,* **um aggreditur, cujus tunc temporis locus verus* ♈ 12°. 53'. 40''. *cum Lat.* 1°.05'.03''. *Bor.*

Londini

Loudini Luna ſtellam

	h.	′	″			′	″
Subripiet	7.	47.	07.	*Lat.* *ª *à centro* ☽ª *ad Bor. in*	*Ingr.*	8.	13½.
Remittit	8.	52.	45.		*Emerſ.*	0.	19½.
Retinet	1.	05.	38.				

11. Decemb. 3. 14. 30 (h. ′); *juxta Ephemeridas, Luna Pleiades aſſequitur.*

Pleiadum occidentalis Lucidior à Luna

	h.	′	″			′	″
Capta eſt	14.	16.	46.	*Lat.* *ª *à centro* ☽ª *ad Bor. in*	*Ingr.*	1.	46.
Remiſſa	15.	11.	34.		*Emerſ.*	2.	15.
Retenta	0.	54.	48.				

Mediæ & Lucidæ Pleiadum

		″	‴			′	″
Subingreſſus	15.	21.	38.	*Lat.* *ª *à centro* ☽ª *ad Auſtr. in*	*Ingr.*	3.	02.
Retectio	16.	16.	18.		*Emerſ.*	0.	55.
Mora ſub ☽ª	0.	54.	40.				

Infimæ occidentali proximæ

	h.	′	″			′	″
Subtectio	14.	50.	06.	*Lat. à centro* ☽ª *ad Auſtr. in*	*Ingreſſ.*	10.	34.
Emerſio	15.	36.	06.		*Exitu*	9.	04.
Mora	0.	46.	00.				

Ultimæ, quæ in cuſpide eſt ad ortum,

	h.	′	″			′	″
Immerſio	16.	09.	19.	*Lat.* *ª *à centro* ☽ª *ad Auſtr. in*	*Ingreſſ.*	9.	56.
Emerſio	16.	53.	09.		*Exitu*	7.	55.
Mora ſub ☽ª	0.	43.	50.				

Cæterum hujus phænomeni tali ordine ſuccedunt Phaſes:

Phaſ.	h. ′ ″	
1	14.16.46.	*Occidentalis lucidior ſubripitur.*
2	14.30.06.	*infima occidentali proxima obtegitur.*
3	15.11.34.	*occidentalis lucidior emergit.*
4	15.21.38.	*media & lucida obſcuratur.*
5	15.36.06.	*infima prodit occidentali proxima.*
6	16.09.19.	*quæ in cuſpide ad ortum occupatur.*
7	16.16.18.	*media & lucida ſe à Luna exerit.*
8	16.53.09.	*quæ in cuſpide ad ortum evadit.*

All thoſe that deſire the Advancement of *Aſtronomy*, and have conveniency of making Obſervations, are herewith ſollicited to apply themſelves with all diligence and exactneſs to obſerve theſe recited Appearances.

Accompt of three Books.

I. *ORIGO FORMARUM & QUALITATUM; juxta Philoſophiam Corpuſcularem Conſiderationibus & Experimentis Illuſtrata*, *à* Roberto Boyle *Nobili* Anglo, *è* Societ. Regia. *Oxon.* 1669. *in* 12°.

HAving formerly, (*Numb.* 11.) given the Contents of this Inſtructive Treatiſe, we again take notice of it here, only to let Forreigners know, that the ſame is now Printed in the *Latin* Tongue, after it had been publick in the *Engliſh* ſince *April*, of the year 1666.

II. *METALLOGRAPHIA, or an Hiſtory of Metals; by* John Webſter, *Practitioner in Phyſick and Chirurgery.* London, *for* Walter Kettilby *in Pauls Church-Yard.* 1670. *in* 4°.

THe Author of this Hiſtory hath with much diligence and curioſity deliver'd therein (to ſpeak of it in general,) the ſigns of Ores and Minerals both before and after digging; the Cauſes and Manner of their Generation; their kinds and differences, and a deſcription of ſundry new Metals, or Semi-metals, as he calls them; together with a diſcourſe of their Vegetability, and the Diſcuſſion of many difficult Queſtions belonging to Chymiſtry. Collected out of the moſt approved Authors, that have written in Greek, Latine, High-Dutch and Engliſh: With ſome Obſervations and Diſcoveries of his own.

But in *particular*, he treateth,

1. Of the Excellency and Uſefulneſs of the knowledge of Minerals and Metals; and of the Antiquity of the melting, refining, and accommodating of them to humane Uſe; and the cauſe of the non-proficiency of Metallick skill, eſpecially here in *England*.

2. Of the Authors, that have written of this Subject: Among whom he chiefly recommends *Agricola*, *Cæſalpinus*, *Ceſius*, *Sarepta Matheſii*, *Kentmannus*, *Lazarus Erker*, *Chriſtophorus Eucelius*, *Caſpar Schwenckfeldius*, *Martinus Rulandus*, *Baſ. Valentinus*, *Paracelſus*, *Joh. Bapt. van Helmont*, *Quercetanus*, *Mylius*, *Beguinus*, *Sala*, *Faber*, *Libavius*.

3. Of the Generation of Metals, and whether they grow like Vegetables: where the Cauſes, aſſigned by the moſt approved Authors for their Generation, are taken notice of.

4. Of the ſigns and Diſcovery of Mines and Ores.

5. Of the Minerals, ſaid to have affinity to Metals, as thoſe that are call'd *Cachimiæ* (i.e. *imperfectæ metalli mineræ*,) *Marchaſites*, *Fireſtones*.

6. Of *Gold*, and the ſeveral ſorts of it, as they are produced by Nature, and in what manner they are ſeverally found; as alſo of the Stones, Rocks and Flints of Gold, and the ſtriking paſſages wherein 'tis found; together with ſome wayes of beating, ſifting and waſhing the Ores thereof, *&c.*

7. Of *Silver*, and the ſeveral wayes of getting the Ore of it; as alſo of its Mines, Conditions, and ſtriking paſſages: of Silver found pure by Nature; and of thoſe ſorts that muſt be

purified, their colors, mixtures, and ſeveral coats, wherein they are wrapt up: together with the method uſed in the Indies of refining Silver-ore.

8. Of *Copper*, its ore, ſtones, operation, ſigns, ſeveral ſorts, and the various preparations it undergoes before it be pure: together with a diſcourſe of the Native and Factitious *Orichalchum*; of the Corinthian Braſs; and of ſome other Compoſitions, which Copper undergoes with other Metals or Minerals; and of ſome Medicins prepar'd out of it.

9. Of *Iron*, its ores, Operations, Stocks, Floats, Paſſages; ſeveral ſorts of Iron-ſtone, and of Medicins prepared of this Metal.

10. Of *Lead*, its Ores, ſeveral ſorts, coats and matrixes; and ſome Medicins it yields.

11. Of *Tin*, its Ores and operations, *&c.*

12. Of the ſeveral ſorts of *Mercuries*; of Cinnaber, and its ſeveral ores and paſſages; and how it is gotten and refined; as alſo of the ſeveral ſorts of Medicaments it affords: where the Author diſcourſes particularly of the *Præcipiolum* of *Paracelſus* and *Van Helmont*.

13. Of *Antimony*; of Biſmuth, or Zink, or Spelter; and of *Cobalt*; together with their Qualities, Ores and Medicaments prepared out of ſome of them: as alſo of Native *Electrum*.

14. Of native *Cadmia*, native *Borax*, *Talk*, *Load-ſtone*, *Bloud-ſtone*, *Lazul-ſtone*, &c.

15. Of the Tranſmutation of Metals; which this Author endeavors to aſſert; taking pains to examine and open the nature of Tranſmutations, and to ſhew ſome ſorts of them, that are common and obvious, and full as ſtrange as this of Metals, thereby to evince, that it is no ſuch impoſſible or ſtrange thing, as many make it to be.

III. *LETTERA di* Franceſco Redi *ſopra alcune Oppoſitioni fatte alle ſue Obſervationi intorno alle VIPERE. In* Firenze, 1670. *in* 4°.

MOnſieur *Charas* having endeavoured in his Book, intituled *Nouvelles Experimences ſur la Vipere*, not long ſince tranſlated out of *French* into *Engliſh* (of which an Account was given in *Numb.*54;)*firſt*, by Experiments to confute the opinion, that the Venom of Vipers reſides in the yellow liquor contain'd in the Bagg about the Vipers Teeth, and then to maintain on the contrary that it conſiſts in their vexed and enraged Spirits; This Author being concerned in this Controverſie, and having made out the former of theſe opinions, as he thinks, by numerous Experiments; doth now in this Letter affirm, that he repeated his former Tryals again and again, and is thereby altogether confirmed in what he then deliver'd about the ſeat of the Vipers poyſon: concluding with more aſſurance, than ever, that the Venom of the *Italian* Vipers doth not conſiſt in an imaginary *Idea* of revengefull Choller, but in that yellow liquor above mentioned; which liquor, he ſaith, if it chance to ſhed or ſpread it ſelf over the mouth and pallat of the Viper, may make that *Saliva* poyſonous, which moiſtens the throat of that animal. Whence he thinks, it would be uſefull, that the Learn'd Authors of the *French* Experiments did make new Obſervations; and if they ſhall be found conform to thoſe they have printed, and indeed contrary to *his*, that then it might be agreed upon, that there was a truth diſcover'd hitherto unknown, *viz.* That the Venom of *French* Vipers conſiſts in a cholerick and vindicative idea of the Fancy; but that of the *Italian*, hath its ſeat in that yellow juyce ſo often ſpoken of: And that, if this latter prove true, it will be no untruth to affirm, that, if a Viper by biting ſhould have conſumed both all the proviſion, which is lodged in the baggs of her teeth, and that alſo, which from the neighbouring parts may be furniſh't, that then her bitings would not be mortal: which, *he ſaith*, he hath heretofore affirmed, and doth ſo ſtill; although M. *Charas* deny it, declaring, that one only Viper being enraged is able to kill as many animals as ſhe ſhall bite.

In this Vindication, our Author alledgeth a good number of freſh Experiments, to maintain his opinion; and beſides them, divers very remarkable obſervations, to ſhew, that Vipers do more eaſily kill ſome Animals, than others; that their biting in ſome places is more dangerous than in others; and that a plentifull effuſion of bloud after the biting is capable to ſave the bitten Animal, *&c.*

Among the many new Experiments he relateth one, which is not to be paſſed by; *viz.* That he had put up in a Glaſs Veſſel the poyſonous liquor taken out of two hundred and fifty Vipers, with a deſign to make various tryals therewith, as often as he ſhould have leiſure; but that being diverted by many avocations from accompliſhing his purpoſe, it came to paſs that that juyce turn'd to a kind of glue, of the colour of Amber, and after the lapſe of thirty days, it became dry and friable, and eaſily reducible to powder, and that having pulverized it, out of a deſire to ſee whether this powder, being put into wounds, made by him in Pullets and Pigeons, did keep the ſame force of poyſoning; he found, that in a little time there dyed all the Pullets and Pigeons, into whoſe wounds he had put a quantity of this powder.

A Note.

WHereas *Numb.*64.p.2071.l.27. mention is made of a Letter of Dr. *Wallis* about the Moons *Perigæum* in the matter of *Tydes*; the Reader may be pleaſed to take this further notice, That that mention is to be underſtood to have been made in the *Latine* Verſion given by the ſaid Doctor, of his Anſwer to the Objections to his *Hypotheſis*; (for in the *Engliſh*, Printed Numb.16, 'tis not:) In which Verſion ſent long agoe by way of Letter to the Publiſher, are theſe words; (to be inſerted after thoſe of Num.16.p.286.l.11. viz. *The Niceties are to be adjuſted in time, from particular Obſervation*;

Et quidem, ſi ad minutias deſcendere libuiſſet, habenda fuiſſet ratio, tum Apogæi *&* Perigæi *Lunæ, tum Obliquitatis Orbitæ Lunaris ad* Eclipticam *comparatæ, & Interſectionum, quas Caput & Caudam* Draconis *dicunt. Sed & monendum fuiſſet, Terræ Motum Annuum atque Diurnum, cùm non eundem ſeu parallelos Axes habeant, ſe mutuo nunc magis nunc minus interſecare: Item, Inundationes* Nili, *aliorumque aliquot fluviorum, ſtatis Anni temporibus factas, ad hujuſmodi forte cauſam referri poſſe: fortaſſis & ſtatos ventos. Sed hæc intacta plane prætereo, aliaque hujuſmodi multa; quæ tamen, ſi quando ad particularia deveniendum erit, conſideranda erunt.*

ERRATA.

IN Numb. 65. were left uncorrected theſe faults of the Preſs. P. 2102. *l.* 13, 14. in ſtead of *two Maggots, and three mites*, read, *ſecondly, Maggots, thirdly, Mites*; as before theſe words it ſhould be, *are bred firſt Hexapods. p.*2014.*l.*17.*r. firſt ſtarted.*

*In this Numb.*p.2022.l 8.r. *up to.*p.2025.l.40.remove the words, *M. Argentar, &c.* which are placed in the next line, to this 40th line. *Ibid.*l.48.r. *Finis.*

LONDON,
inted for *John Martyn*, Printer to the *Royal Society*, 1671.

Numb. 67.

PHILOSOPHICAL TRANSACTIONS.

Januar 16. 167.

The CONTENTS.

An Accompt of ſundry Experiments, made and communicated by that Learned Mathematician Dr. Eraſm. Bartholin, *upon a Chryſtal like Body ſent out of* Iſland. *An Extract of a Letter, containing a way of making Sea-water ſweet. An Extract of another Letter, concerning two Experiments made for finding another paſſage of the Urine beſides the known one. A Relation of the abundance of Wood found under ground in* Lincoln-ſhire *A Deſcription of the Stone-Quarry near* Maeſtrich.

An Accompt of ſome Books: I. TRACTS written by the Honourable Rob. Boyle, *of a Diſcovery of the* Admirable *RAREFACTION of the AIR*; &c *II. ELEMENTA GEOMETRIÆ PLANÆ, Auth.* Ægidio Franc. de Gottignies. *III. SYNOPSIS GEOMETRICA, cum tribus opuſculis, Auth.* Honor. Fabri. *IV. DIALOGI PHYSICI, de LUMINE; vi PERCUSSIONIS; LIQUORIS ELEVATIONE per CANALICULUM; & Variis Selectis. Auth.* Hon. Fabri. *V. ANTONII MOLINETTI Diſſertationes ANATOMICÆ & PATHOLOGICÆ de* SENSIBUS *& eorum Organis.*

An Accompt of ſundry Experiments made and communicated by that Learn'd Mathematician, Dr. Eraſmus Bartholin, *upon a Chryſtal-like Body, ſent to him out of* Iſ[illegible]

BEfore we come to the Relation it ſelf of theſe Experiments, we cannot but premiſe an *Extract* of the Obliging Letter, written to the Publiſher, by the ſaid Doctor *Bartholin* from *Copenhagen* Febr. 27. 1670; Engliſh't as follows;

—I Know the many Excellencies of the Engliſh Nation, and that innumerable new things in the matter of knowledge iſſue thence, and diffuſe themſelves through *Europe*; though they arrive ſomewhat ſlowly hither. We are here preſſed with ſo many cares, that though we want no will to contribute ſomething to the advancement of knowledge; yet being deſtitute of the leiſure neceſſary for it, and diverted by two difficult Profeſſions, the Medical and Mathematical, we can rather admire the performances of others, than engage for any thing of our own. But yet, not altogether to fruſtrate your expectation, and to give you ſome Teſtimony of my affection and endeavors, I here ſend you ſome Experiments made with a certain Chryſtal-like Stone, ſent me out of *Iſland*, together with a piece of that Stone, to make the Tryals your ſelf. ~~Farewell.~~

For the reſt, we are now labouring to publiſh a more corrected and better digeſted Edition of *Tycho Brahe's* Works; a buſineſs of much time and exceeding great labour: Which care while I am engaged in, I muſt lay aſide other matters. Yet I hope, that my part in this work will ſhortly be over; there remaining almoſt nothing, but to provide the charges neceſſary for the Impreſſion; which all true Lovers of Aſtronomy cannot but have a great concern for.

This Letter being ſent to *Hamborough* to that Ingenious Phyſitian, Dr. *Matthias Paiſenius*, with a deſire to tranſmit it to *London*, this worthy Perſon was pleaſed to incloſe it in one of his, written to the Publiſher; which, ſince it treateth of the ſame argument (I mean, the *Iſlandian* Stone,) will not be amiſs to ſubjoyn here the Breviate of.

—*[illegible] ſervations of the Excellent* Bartholin *upon the* Iſland-C[illegible]al *are indeed conſiderable as well as painfull. We have here alſo made ſome Tryals of it upon a piece, he preſented me with; which confirm his obſervations. Mean time, we found it ſomewhat ſciſſile and reducible by a knife into thin* lamina's *or plates, which, when ſingle, ſhew'd the Object ſingle, but laid upon one another, ſhew'd it double; the two images appearing the more diſtant from one another, the greater the number was of thoſe thin plates laid on one another. With ſubmiſſion to better judgements, I think it to be a kind of* Selenites. *Some of our curious men here were of opinion, that the* Rhomboid *figure, proper to this Stone, was the cauſe of the appearances doubled thereby. But having tryed, whether in other Tranſparent Bodies, of the like Figure, the like would happen, we found no ſuch thing in them; which made us ſuſpect ſome peculiarity in the very Body of this Stone.*

Theſe Letters being thus premiſed, we now come to relate the Brief of the Obſervations and Experiments themſelves; referring the more Curious Reader to the larger Accompt of them, and their Mathematical Demonſtrations, as they are to be found in the Printed Book, entitul'd *Eraſmi Bartholini Experimenta Chryſtalli Iſlandici Diſ-Diaclaſtici; quibus mira & Inſolita* REFRACTIO *detegitur.* Haſniæ A. 1669.

1. The Inhabitants of *Iſland* and our own Merchants inform us, *that* this kind of Chryſtal is found in divers places of that Country; but chiefly digg'd out of a very high mountain, not far from the Bay of *Roerfiord*, which lies in 65. degr. *Latitude*; *that* that Mountain reacheth Southward, and hath its whole outſide made up of this ſubſtance, without a neceſſity of digging deep for it; *that* it is cut out by Iron-tooles, in bigneſs of a Cubick foot, or ſomewhat better: and *that* out of its corners there is ſometimes found grown out a harder matter, not unfit to cut glaſs, of a figure different from that of the whole maſs, and approaching to that of Diamonds.

2. The Figure of this Chryſtal-ſtone is like a *Rhombick* or *Rhomboid Priſme*. Nor hath the whole Body that Figure only, but all the parts of it, when broken into ſmall pieces, keep the ſame; except that in ſome caſes the ground, whence 'tis digged, yields ſuch as are of a Triangular Pyramid-figure.

3. This Subſtance is Electrical, attracting (to ſpeak with the Vulgar,) when heated, ſtraw, Feathers, &c.

4. It is not ſo hard, as to endure poliſhing : Nor is it eaſily conſumed ; nor reduced into a *calx* but by a ſtrong fire, by which it will turn into a ſubſtance like unſlaked lime, which will heat a wet finger, and, when ſprinkled with fountain-water, will buble up, and become like common lime.

5. *Aqua fortis* being by me dropp'd upon it, it was corroded, and the ſuperficial parts were put into a motion with ſome noiſe. And when I pulverized it in a mortar, Aqua fortis, powred on it, made it boyle, till all was diſſolved, and the *Menſtruum* tinged with a yellowiſh colour. Then putting it into a Thermometer furniſht with a hollow glaſs ball, it conſiderably ſhew'd the difference of Heat and Cold. The powder being diſſolv'd in *Aqua fortis*, I dropp'd ſome Spirit of *Vitriol* upon it, to ſeparate the thick from the thin, and to precipitate the white *calx* to the bottom.

6. The ſides of this Body are exceeding ſmooth ; which is then eaſily obtained, if a thinner piece be nimbly broke aſunder with your finger. But if you ſtrike it with a hammer, the percuſſion hath not the ſame effect upon, nor is equally reſiſted from every part ; whence the ſmooth ſides of this Mineral become often ſcabrous. The whole Body is rather clear than bright, of the colour of limpid water ; but that colour, when it hath been immerſed in water and dryed again, becomes dull. Hence it is, that in its native place the upper ſurface is darkiſh ; becauſe of the Rains and Snows fallen upon it. Sometimes there appear alſo ſome reflections of colours, as in the Rain-bow. The Angles are not pointed alike, all the flat ſides being obliquely inclined to one another. The oppoſite plains are parallel.

7. In this Chryſtallin Priſme, two of the plain Angles are always acute, and the two other obtuſe ; and never any of them is equal to the collateral Angles of the Inclinations.

8. The Objects ſeen through it, appear ſometimes, and in certain poſitions of the Priſme, double: Where 'tis to be noted, that the diſtance between the two images is greater or leſs, according to the different bigneſs of the Priſme ; inſomuch that in thinner pieces this difference of the double image almoſt vaniſheth.

9. The Object appearing double, both images appear with a fainter colour; and ſometimes one part of the ſame *ſpecies* is obſcurer than the other.

10. To an attentive Eye, one of theſe Images will appear higher than the other.

11. In a certain poſition the Image of an Object, ſeen through this Body, appears but ſingle; like as through any other Tranſparent Body.

12. We have alſo found a poſition, wherein the Object appears ſixfold.

13. If any of the obtuſe Angles of this Priſme be divided into two equal parts by a line, and the viſual rays do paſs from the Eye to the Object through that line, or its parallel, both Images will meet in that line, or in another parallel to it.

14. Whereas Objects, ſeen through Diaphanous Bodies, are wont to remain conſtantly in the ſame place, in what manner ſoever the tranſparent Body be moved; nor the Image on the Surface move except the Object be moved; we have obſerved here, that one of the Images is moveable, the other remaining fix; although there be a way alſo, to make the fixed image moveable, and the moveable fix in the ſame Chryſtal; and another, to make both moveable.

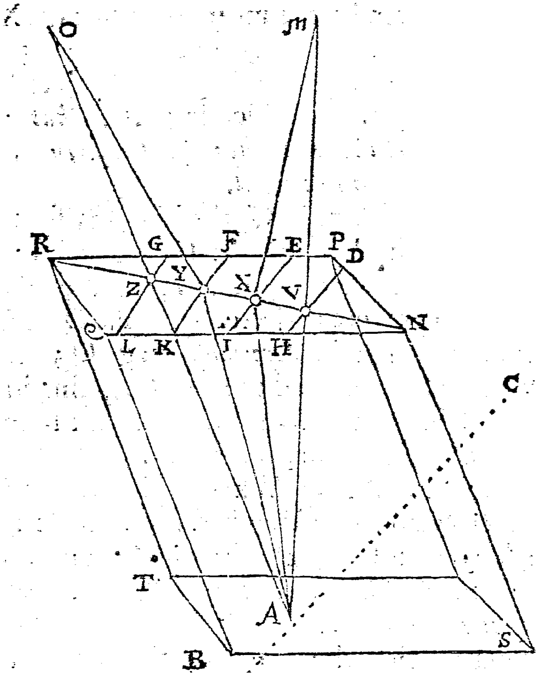
15. The *Moveable* Image doth not move at random, but always *about* the *Fixed*, which while it turneth about, it never deſcribeth a perfect Circle but in one caſe.

16. *Dioptricks* teach, that a Diaphanous Body, having one only ſurface, ſends from one Object but one Image refracted to the Eye; and having more Surfaces than one, it repreſents one Image in each; But whereas in our ſubſtance there occurs but one plain ſuperficies to the Eye and yet a double image of one Object; it concern'd us to conſider, whence this double image might be cauſed. *Two* ways offer'd themſelves to us, *Reflection* and *Refraction*. How *Reflection* could perform it, was difficult to find. For, having dulled the clearneſs of the two plain ſides of our Chryſtallin Priſme, thereby to make them unfit for Reflecting the light; the Rays being directed through its upper and lowermoſt ſuperficies, the image

ſtill appear'd double. Again, two *ſpecies* appearing through a great Priſme, upon breaking of the ſame into pieces and ſo reducing it into divers ſmaller ones, it came to paſs, that through each of theſe leſſer portions the ſame object was ſeen always double. Whence I Collected, that if it ſhould be ſaid, that *one* of the images proceeded from the Reflection of the plain *ſides*; the former of theſe Experiments would diſcountenance that aſſertion. But then if another ſhould derive the cauſe from ſome internal Reflection of the Surfaces of this Body, certainly the ſame effect would not have been found in every one of its parts, but the double appearance, that was exhibited in the ſmalleſt portion, would have been multiplied in a greater bulk.

Reflection therefore not ſatisfying, we recurred to *Refraction*. But, whereas 'tis known, that no image can paſs through two Diaphanous Bodies of a different nature, but by Refraction, and that one image ſuppoſeth one Refraction; it did follow, that, if Refraction were made the cauſe of this *Phænomenon*, there would be a double Refraction for a double image. And, foraſmuch as the Appearances of our *Iſland*-Chryſtal are not of the ſame kind, but one of them is fixt, the other moveth, we ſhall alſo diſtinguiſh the Refractions themſelves, which refract the double Rays arriving to the Eye, and call the one, which ſends the *Fixt* image refracted to our ſight, *Uſual*; the other, which tranſmits the *Moveable* to the Eye, *Un-uſual*. And hence, namely, from this peculiar and notable propriety of the double Refraction in this Iſland ſtone, we have not ſcrupled to call it *Dis-diaclaſtick*.

This being ſuppoſed, it will not be irrational to ſuſpect, that theſe two Refractions proceed from different principles. For, ſince it is commonly known from *Dioptricks*, that an Object, by viſual rays affecting the Eye, exhibits ſome Image on the *Superficies* of the Diaphanous Body, which Image is but one, as long as the *Superficies* is one, and the upper plain parallel to the lower; as alſo, that if, the Eye remaining ſteady, the Diaphanous Body be moved, that image remains always fixt, as long as the Object, whence it comes, remains unmoved. Wherefore in this Tranſparent ſubſtance, the Image which appears fixt, may proceed according to the ordinary Laws of *Uſual* Refraction ; but that, which moveth, and is carried about according to the motion of the Diaphanous Body, while the Object remains un-ſtirr'd, ſheweth an *Un-uſual* kind of Refraction, hitherto un-obſerved by *Dioptricians.*



Hence, that I might examine the nature and difference of both, I put, upon ſome Object, as the point A, the Priſme of my Double-refracting Chryſtal N, P, R, Q, T, B, S; and the Eye M, being perpendicularly poſited over the upper plain of the Priſme N, P, R, Q, I noted, whether there was any Refraction of the point A, (for the *uſual* Laws of Refraction teach, that there is none.) But the Perpendicular Ray of the Eye was obſerved to paſs not through the *Moveable* but the *Fixed* Image; thereby being conformable to the Rules of *Vſual* Refraction, as ſtriking the Eye unrefracted, ſo that the Eye, the Image, and the Object, were ſeen in the ſame Line. But, when in the ſame ſcite of the Eye, the Object A, did alſo exhibit the other Image X; at no ſmall diſtance from the former; I took notice, that this Object A, was not ſeen unrefracted by the means of the image X, though the Eye M, remain'd perpendicular over the plain; and that conſequently this *Vn-uſual* Refraction is not ſubject to the received Axiome of *Dioptricks*, which imports, *That a Ray falling* perpendicularly *on the ſuperficies of a Diaphanous Body, is not refracted, but paſſeth unrefracted.*

Next, I ſo placed the Eye in O, that the Ray from the Object A, arriving to the Eye, might be parallel to the lines RT and Q B, of the plane R, Q, T, B, &c. then it appear'd, that the Rays were trajected from the Object A, without Refraction, through the *Moveable* image Q; the Object A, the moveable image Z, and the Eye O, being in the ſame line; and that the ſame Object A, did tranſmit to the Eye O, remaining in the ſame poſition, yet another *ſpecies* Y; through the Refracted Ray AYO Whence it was manifeſt to me, that this *Vn-uſual* Refraction had for its Rule the *Parallel* of the *Sides* of this Double-refracting Chryſtal, while the *Vſual* Refraction was directed according to the *Perpendicular* of the *Superficies*.

But conſidering that the place of the point, appearing through our Diaphanous Body, cannot eaſily be determin'd, as being only obvious in the uppermoſt part; we ſhall add the way, whereby we have found its diverſity, by drawing, on the ſubjacent table, a ſtraight line through that point; the place of which line will be determined by the one Eye *through* this Chryſtal, and by the other Eye *without the* Chryſtal. For, in the ſame *Figure*, let through the Object A, be drawn upon the Table, a ſtrait line BC. The Eye being in M, that double line H D, and I E, will appear, the *ſpecies's* being caſt on the upper ſurface: And if you attend well, you will obſerve one of the Images, *viz.* the Fixt H D to be congruent to the ſubjacent line B C, whil'ſt the other, namely the Moveable E I, tendeth towards R. But, if afterwards the Eye be poſited in O, the ſame Object, I mean the line B C, will not only be repreſented double by the images K F, and L G; but alſo the Movable Image G L be congruent to the inferiour line B C; while the Fixed F K is not ſo, but tends towards N.

After the Author hath given us theſe Experiments, he undertaketh to determine the *Quantity* of the Refractions in this Double-refracting Body; and haveing firſt given the *Demonſtration* of the Method of Meaſuring the Refraction of *Glaſs*, (omitted by *Des-Cartes* in his *Dioptricks*,) he finds, after ſeveral Tryals, the Angle of Inclination to the Angle of Refraction in this *Iſland*-Chryſtal to be as 5 to 3.

But this Ingenious Perſon doth not ſtop here, but proceeds to *demonſtrate* all the recited Experiments; obſerving firſt, that the Teachers of the *Corpuſcularian* Hypotheſis, which includeth that of *Figures* and *Pores*, could not wiſh for a fitter Body, than this, to aſſert their Doctrine; in regard that it appears, firſt, that this Double-refracting Body hath its Pores according to the *Ductus* of the ſides, and parallel therereto; ſince it may be obſerv'd, that, according to this diſpoſition of the ſides, it is broken, and the parts ſever'd from one another; and that one of the Images, namely the *Moveable*, paſſeth through them. Next, beſides theſe Pores, lying according to the Paralleliſme of the ſides, it hath others, ſuch as Glaſs, Water, and right Chryſtals have, through which the *Fixt* Image is tranſmitted.

But paſſing by theſe, our Author aſſumeth two *Hypotheſes*, as neceſſary to his deſign, not ſo much found out by Ratiocination, as by the above related Experiments. The one is, that there are ſome Lines, by which the Rays paſs through the tranſparent Body un-refracted; which Lines though they have been held to be Perpendicular in Diaphanous Bodies hitherto known, yet this Author requireth not, that they ſhould be always ſuppoſed ſuch, ſince they may perhaps in

ſome

ſome caſe be not ſuch. The *other* is, that it may be ſuppoſed, that half the light or appearance, diffuſed from the Object, is refracted according to the *Uſual* Refraction; but the other half according to the *Un-uſual* Refraction; or, which is all one, that the Uſual and Un-uſual Refraction have the ſame power to refract the Rays of the Objects. The former of theſe Suppoſitions he collects from Exper. 14; the latter from Exp. 8. But, how he proceeds in theſe *Deductions*, and the thereon grounded *Demonſtrations*, may be more fully and more plainly ſeen in the above-mentioned *Tract* it ſelf, than can be conveniently deliver'd in this *Epitome*.

An Extract of a Letter from a Learned French Gentleman, concerning a way of making Sea-water ſweet.

MOnſieur *Hauton* hath now declared his ſecret of making Sea water ſweet. It conſiſts *firſt* in a *Precipitation*, made with Oyl of Tartar, which he knows to draw with ſmall charges. *Next*, he *diſtills* the Sea-water; in which work the Furnace taketh up but little room, and is ſo made, that with a very little wood or coal he can diſtill 24 pots of water in a day: For the cooling of which, he hath this new invention, that inſtead of making the *Worm* paſs through a Veſſel full of water (as is the ordinary practiſe,) he maketh it paſs through one hole, made on purpoſe out of the Ship, and to enter in again through another: So that the Water of the Sea performeth the cooling part: By which means he ſaveth the room, which the common *Refrigerium* would take up; as alſo the labour of changing the Water, when the *Worm* hath heated it. But then *thirdly*, he joyns the two precedent Operations, *Filtration*, thereby perfectly to correct the malignity of the Water. This Filtration is made by means of a peculiar Earth, which he mixeth and ſtirrs with the diſtilled water, and at length ſuffers to ſettle at the bottom. *Paris* Febr. 22. 1670.

An Extract of another Letter written by the ſame, concerning two Experiments made for finding another Paſſage *of the* Urine, *beſides the known one; as alſo ſome Circumſtances relating to the precedent Invention of making Sea-water potable.*

HAving been, not long ſince, employed in ſearching after the *Paſſage* of the *Urine* * in Animals, I made, for that purpoſe, a Dog drink a good quantity of water, and thereupon cauſed his *Ureters* to be well tyed about, and emptied his bladder. After two hours I found the Bladder empty, and the *Ureters* were not tumid above the Ligature. Being ſurpriſed thereat, I believed, that the cauſe might be the too much cooling of the inward parts, that had all this while been expoſed to the Air; the Section having been made Croſs-wiſe, afrer the ordinary manner. To avoid this inconvenience, I thus reiterated the Experiment upon another Dog; I cauſed a ſmall opening to be made on each ſide, ſufficient to find and to tye the Ureters, and to ſqueeſe the Urine out of the Bladder, by preſſing it with ones hand. This done, I made theſe Openings to be ſow'd up again; and then having made the Dog drink good ſtore of water, I left him for near three hours in the leaſt violent poſture that his Ligatures would permit. Afterwards having open'd both the holes, and the Bladder being preſſed with the hand, there iſſued out of it a pretty quantity of Urine, and the Ureters ſeemed to be a little ſwelled above the Ligature. This Operation was made with great exactneſs; but yet as it is of importance for diſcovering the way of the Urine, I would have repeated it often, if I had not been obliged haſtily to come away from the place where I then was, I am not now at leiſure to try it again; but I exhort you, *Sir*, to engage ſome of your beſt Anatomiſts, among other reſearches to employ themſelves in this Inquiry.

---

* *What is here more largely related, was briefly intimated in* Num. 65. p. 2084.

Monſieur *Hauton* maintains, that his diſtill'd Sea-water (whereof I formerly wrote to you the proceſſe) is altogether ſalubrious. He proveth it *firſt* from Experience, it having been given to Men and Beaſts without any ill effect at all upon them. *Secondly*, from Reaſon, grounded on this, that that peculiar Earth, heretofore made mention of, being mixed with the diſtilled Water, blunts the points of the Volatil Spirits of the Salt, and ſerveth them for ſheaths, if I may ſo ſpeak; taking-away their force and maligne ſharpneſs, &c. St. *Germain*, October 30. 1670.

A Relation

Of the abundance of Wood, found under ground in Lincoln-ſhire; *communicated by a Friend, well acquainted with that Country.*

THat Fenny Tract, call'd the *Iſle of Axholme*, lying part in *Lincoln-ſhire* and part in *York-ſhire*, and extending a conſiderable way, hath anciently been a Woody Country, witneſs the abundance of Oak, Firr, and other Trees, of late frequently found in the *Moore*; whereof ſome Oak are five yards in compaſs, and ſixteen yards long; others ſmaller and longer, with good quantities of Akorns near them, lying ſomewhat above three foot in depth, and near their roots, which do ſtill ſtand as they grew, *viz.* in firm Earth below the Moor. The Firrs lye a foot or eighteen Inches deeper, more in number than Oak, and many of them thirty yards long; one of them being, not many years ſince, taken up of *thirty ſix* yards long beſides the top; lying alſo near the root, which ſtood likewiſe as it grew, having been burnt and not cut down, as the Oak had been alſo. The Number of theſe trees is reported by Mr. *Dugdale*, in his Book of *Drayning the Fens in England* (where you will find this whole narrative confirm'd) to be ſo great, that the Inhabitants have, for divers years laſt paſt, taken up many Cart-loads in a year.

As to the firſt time of the overflowing of this Woody level, no Account is given, that I know of, not by the Inquiſitive and Learned Antiquary Mr. *Dugdale* himſelf. He only ſaith, that the depth of the Moor evinceth, that it hath been ſo for divers hundreds of years,ſince *that* could not grow to that thickneſs it is of, in a few Ages. Of the Cauſe thereof he concludeth, that to have been the Muddineſs of the conſtant Tydes, which flowing up *Humber* into *Trent*, left in time ſo much filth, as to obſtruct the Currents of *Idle*,*Done*, and other Rivers, which thence flow'd back and overwhelm'd that flat Country.

A Deſcription

Of the Stone-Quarry near Maeſtrich; *communicated by an Obſerving Perſon, converſant in that Country.*

There is an excellent Quarry,within Canon-ſhot of *Maeſtrich*, upon the very brink of the River *Maſe*, lying in a Hill, where there are about 25 fathoms of Rock and Earth over head; the length of the Hill being of ſome miles extending along the River towards *Liege*, ſcituate on the ſame River; and near *Maeſtrich* having in breadth, ſome ½ or ¾ of a mile, but ſome more, farther off. This Quarry hath one Entry towards the River, where Carts can paſs with great eaſe, and unload the Stones upon the brink of the River, the Quarry within lying parallel to the Horizon or level, (which is a great advantage) and elevated but very little above the River.

This ſame Quarry, which hath, well nigh, undermin'd the whole Hill,affords one of the moſt ſurprizing Proſpects, when well lighted with many Torches, that one can imagine. For, there are thouſands of ſquare Pillars in large level Walks, and thoſe almoſt every where, above 20, and in ſome places, many more foot high, and all wrought with ſo much neatneſs and regularity, that one would think, it had been made rather with curious Workmanſhip for an under-ground Pallace,than that thoſe Pillars and Galleries were made by Quarriers, that did it only for getting Stone to build above-ground.

This Quarry ſerveth the People, that live thereabout, for a kind of impregnable Retreat,when Armies march that way. For, being acquainted with all the ways in it, they carry into it whatſoever they would have ſafe, as well their Horſe and Cattel, as their Moveable furniture, till the danger be over;

there being ſo vaſt a deal of room, that 40000 People may ſhelter themſelves in it. And he that would attempt to ſeek them out in this vaſt Wilderneſs of Walks and Pillars, without an expert Guide, would not only be in hazard of looſing his way, but of being knock't in the head at the Corner of every Pillar, where people lurking in the dark with their Carabins and Fowling pieces, would have fair opportunity to ſhoot them by the light of their own Torches.

In this vaſt *Grotto* 'tis remarkable, that there is but little Rubbiſh: which ſhews both the goodneſs of the Stone, and the carefulneſs of the Workmen. And in divers places there are little Pools of Water, perhaps made on purpoſe for Beaſts to drink, and to ſerve for other uſes in time of need: For in no place almoſt are there any Droppings to be ſeen; nor are the Walks at all wet under-foot; only it ſeems, that Rain gets in by the *Air-ſhafts*, which, for ſaving of labour, and perhaps too, to make theſe Pools, are let down from ſuch places commonly, as are the Pools thereabout; and ſo the Rain, that falls on the higher grounds, does eaſily find the way thither.

An Account of ſome Books.

I. *TRACTS written by the Honourable* Robert Boyle, *of a Diſcovery of the* Admirable *RAREFACTION of the AIR (even without Heat:) New Obſervations about the DURATION of the SPRING of the AIR: New Experiments touching the CONDENSATION of the* Air *by meer COLD; and its COMPRESSION without Mechanical Engins: And the admirably DIFFERING EXTENSION of the ſame Quantity of* Air *rarifyed and compreſſed.* London, *for* H. Herringman, 1670. *in* 4°.

THE main drift of theſe Excellent *Tracts* is, to invite the Curious to obſerve the ſtupendious Mutability of the *Air*, as to Rarity and Denſity, whereby the ſame Quantity of Air, being ſometimes compreſs'd, ſometimes dilated, may change its Dimenſions to a degree, that ſeems almoſt to tranſcend the power of Nature and Art, and might be look't upon as incredible, if it were abruptly and nakedly propoſed; or by a perſon of only *common* ſkill in theſe matters.

It will then appear by the Experiments and Calculations made by our Noble Author, that, according to the leaſt Eſtimate of any recited in them, the Extenſion of the ſame Quantity of Air, is as 1. to 2744, or thereabouts: And if, inſtead of the moderateſt, there be taken the greateſt Expanſion of the Air; being as about 13000 to 1, when the *uncompreſt* Air was highly rarify'd, that number being multiplyed by 40, becauſe of the great Compreſſion of the Air, effected by Cold (as appears in the Third of theſe Tracts,) will amount to 520000, for the number of times, by which the Air at one time exceeds the ſame portion of Air at another time: Which is an Expanſion ſo great, that it will eaſily keep the Reader from thinking the Title of this *Diſcourſe*, where the Rarefaction of the Air is call'd *Admirable*, immodeſt.

It will alſo appear by theſe Tracts, that the Air may by the Intervention of Art and Inſtruments be much more expanded, than it has yet been found to be by the bare application of External Heat, though it were that of an Intenſe Fire it ſelf.

The Natural Philoſopher will doubtleſs, upon the reading of this ſtrange Expanſion of the Air, be excited to conſider, when he ſhall look on one of our Author's well exhauſted Receivers, How ſmall a proportion the Common Aereal particles, which are very ſparingly diſpers'd there, bear to the whole Cavity of the Veſſel, which, before it was exhauſted, was thought to be repleniſh't with Air alone. Certainly both the *Carteſians* and *Epicureans* will find themſelves highly concern'd in this matter. The *former* will endeavor thereby to eſtabliſh the neceſſity of their *Materia ſubtilis*, to maintain the *Plenitude* of the World, and the Circle they attribute to Moving Bodies. The *latter* will think, they have cauſe here to triumph, as believing to have met with a more illuſtrious Inſtance, than ever, of their *Vacuum Coacervatum* within the World; ſince here is an impenetrable Veſſel, out of which 'tis manifeſt, that an almoſt incredible proportion of Aerial ſubſtance hath been made to iſſue; whereas 'tis no ways manifeſt to any of our ſenſes, that any other Body hath got in to ſucceed in its room.

II. *ELEMENTA GEOMETRIÆ PLANÆ. Authore* Ægidio Franciſco *de Gottignies Bruxellenſi, Soc. Jeſu in Collegio Romano Matheſeos Profeſſore*, Romæ 1669. in 12.

THis Author, in a *Monitum* to the Students of Geometry, intimates, that he hath read Mathematicks more than 7 years at *Rome*; that it hath been his cuſtome to adviſe his Scholars *firſt* to read over the Definitions, the Titles of Propoſitions, and to exerciſe themſelves in the Conſtruction of Problems, without being ſolicitous of the truth of the Propoſitions or Conſtructions, until they become familiar; and after they are ſomewhat converſant with the Geometrick Aſſertions and Phraſes, then to doubt of their truth as much as they pleaſe, and ſtudy their Demonſtration. The ſame, in the Proeme thinking it convenient to begin with Quantity, treats of it abſtractly, as void of ſuch affections and modes as are congruent thereto.

1. In his firſt Chapter he giveth Definitions, Poſtulates, and Axiomes.

2. In the ſecond, becauſe one quantity in relation to another is ſaid to have a *Ratio* or *Proportion*, he treats of *Ratio's*, and delivers the doctrine of the fifth Book of *Euclid*; to which are annexed 7 queſtions about *Geometrical Proportions* with their Solutions, clearing up the debates, that through the miſtakes of ſome late Authors have riſen about *Ratio's*.

3. He treats of Angles, and of the affections of Angles in plain Right-lined Figures. And at the end of this *Chapter* he ſtates the queſtion, Whether an Angle be a *Quantity* ſhewing, that *Clavius* affirms *all Angles* to be quantities; *Peletarius* denyes the *Angle* of *Contact* to be a quantity; *Tacquet* condemns both, denying *any Angle* to be a quantity, to whom our Author aſſents, and on this Hypotheſis removeth 5 Paradoxes, that are natural to the other aſſertion. And whereas a late Writer alledgeth, that it may be pleaded to be the opinion of the Antients, he ſaith, that among the Learned moderns, it is now refuted, herein ſiding with *Gregory of St. Vincent*, *Aynſcomb*, *Tacquet*, and *Dr. Wallis*.

4. He treats of Rectangles.

5. Of Triangles and Right-lined Figures.

6. Of Circles, where he delivers the Doctrine of the third Book of *Euclid*; and, imitating *Archimedes*, enlargeth this *Chapter* with other propertys, which he had firſt ſhewn to be congruent to Right-lined Figures.

7. He treats of Problemes, by which a Preparation is made to paſs from Speculation to Uſe and Practice.

The Author having thus altered *Euclid*'s order, giveth an *Index*, to ſhew where the Propoſitions of the 1, 2, 3, 5 and *6th*. Book of *Euclid* are to be found in theſe Elements.

He hath paſſed over all the Propoſitions of the *4th*. Book of *Euclid*, as ſuperfluous in his method: In that Book, 'tis known, that *Euclid* teacheth, How to Inſcribe or Circumſcribe *ſome*, but not *any* Regular Figures about a Circle: Of this he treats at the end of the *7th*. Chapter. This Doctrine is either neceſſary for Practice, as in *Fortification*; or in order to the Conſtruction of the *Canon* of *Sines*. He intends to treat of *Trigonometry* and *Practical Geometry* elſewhere, ſaying in his Dedication;

Euclidem ex novo adornare ſtudui, brevi tamen ſcriptione concinnatum, ut eſſet opportunior. Ex quo tanquam ex fundamento pendet reliqua mearum doctrina tractationum, quas prælo paratas me habere probè noſti. As to his method of Demonſtration, he ſaith, *Demonſtrationes vix alias pono, quàm affirmativas, ut diſcentibus conſtet, ea quæ proponuntur non tantùm vera eſſe, ſed etiam cur vera ſint: in Euclide non pauca per negativas demonſtrationes probantur, vel in his probandis negativè tantum probata aſſumuntur; & An rectè omnia, nonnulli controvertunt.*

III. *SYNOPSIS GEOMETRICA; cum Tribus Opuſculis, De LINEA SINUUM & CYCLOIDE; De MAXIMIS & MINIMIS, Centuria; Et SYNOPSIS GEOMETRIÆ PLANÆ, Auth.* Honor. Fabry *S. Jeſu.* Lugduni Galliarum 1669. in 12°.

THis Author in this *Geometrical Synopſis* hath endeavour'd, as M. *Gottignies*, (juſt now taken notice of,) promiſeth to do in his *New Euclid*, to render *Geometry* clearer and eaſier by delivering ſuch Demonſtrations, as prove the thing in hand by *direct* and *intrinſick* Principles, not ſuch as are indirect, and leading *ad abſurdum & impoſſibile*, whereby 'tis only concluded, that the thing cannot be falſe, but not ſhewn, why it is and muſt be true. In reference to which, he conſiders, that, whereas *Geometry*

metry conſiſts in demonſtrating the proprieties of *Quantity*; there is no ſuch propriety, but it belongs to it by ſome genuine and intrinſick principle, eaſily to be found out by the *Analyſis* or *Geneſis* of Quantity. By which way he Judgeth, that *Geometry* may be exceedingly contracted, foraſmuch as very many things, ſeparately demonſtrated in the received way, may then be evinced joyntly by one plain and eaſy Demonſtration; conſidering that, where the ſame propriety belongs to various quantities and figures from the ſame intrinſick Principle, whether they be Plain, or Solid, or Right-lined, or Curve, or Mixt; nothing hinders, but *that* propriety may be Demonſtrated of them all by one onely Demonſtration.

And hence this Author is inclinable to lay aſide thoſe many Diviſions of Geometry, as are made by Authors, *viz.* into *Trigonometry*, *Planometry* and *Stereometry*; and peculiar and prolixe Treatiſes of *Conical Sections*; of the *Sphære* and *Cylinder*; of *Lines* of divers kinds; of *Plain* and *Sphærical Triangles*; of a *Solid Angle*; of *Proportions* and *Proportionalities*, &c: eſteeming, that a more convenient Diviſion will ſerve his Deſign; whence he compriſeth this whole *Synopſis* in two parts.

The *Firſt* treats of the *Elements* for Beginners, and contains 6 parts: In the firſt whereof are deliver'd the Definitions and Explications of Terms, the Axioms, and *Poſtulata*. In the ſecond, are explain'd the *Geneſis* and *Analyſis* of Figures, and their different *Claſſes*. In the third, are demonſtrated the Elements of *Lines* and *Angles*. In the fourth, is treated of *Ratio's* and *Proportions*. In the fifth, are conſidered the *Products* of the *Segments* of a *Line*, multiplyed into one another. In the ſixth, are handled the remaining Elements.

In the *Other*, he proceeds to the Demonſtration of higher and abſtruſer things; and this part he divideth into ſeveral *Claſſes*, each of which contains all its *homogeneal* figures, Right-lin'd or Curve, Solid or not Solid; there being ſo many ſeveral *Ranks*, as there are different ways of their Generation. Theſe *Claſſes* are here diſtributed into two ſorts, the *one* contains thoſe Figures, whoſe Generating quantity is drawn either into the whole Altitude, or into its Rational or Commenſurable Segment, for the Æquation of the Figure; the *other* is of thoſe, whoſe Generating quantity can only be drawn into an Irrational Line, for Æquation. But he adds, that it often falls out, that one and the ſame Figure belongs to ſeveral *Claſſes*, in regard that it may be reſolved into divers Elements, or have more than one *Genitrix*, and therefore, according to the variety of the *Genitrix*, may be diverſly generated. And this, he eſteems, doth very much commend his Method, in regard that there is the ſame Æquation of the ſame Figure, whether it be demonſtrated in this or that Claſſis by this Intrinſick Principle.

Mean time this Author denyeth not, that this kind of *direct* Method was before him deliver'd and publiſht by *Bonaventura Cavalerius*, but adds, that it was done with ſuch difficulties and obſcurities, as deterred young Students from it; which in this *Synopſis* are ſaid to be avoided, or removed.

As to the Three *Opuſcula*, adjoyned to the *Synopſis*, the Author affirms of the *Firſt*, that it was publiſh't *Eleven years* ſince, but uncorrectedly; now Re-printed more carefully, and with a deſign, to give a Specimen of his new Method in that abſtruſe Argument; adding withal, that, for ought he knows, he is the firſt that hath written of this Subject; only he had ſeen ſome few things concerning the *Cycloid* in *Torricellius*, in that *Appendix*, which he ſubjoyn'd to the Problem of the *Dimenſion* of the *Parabola*, where he very well demonſtrates, that the Space contained by the *Cycloid* and *Baſis*, is Triplicate to the Generating Circle. But our Author affirms to have here added many new Demonſtrations, alledging, that *Torricellius* in the ſaid *Appendix* hath demonſtrated nothing elſe, but that one thing juſt now recited. And though the ſame in his *Firſt Book De Motu Gravium* doth *propoſe* many excellent things of the *Cycloid*, yet our Author obſerveth, that he hath *demonſtrated* none of thoſe.

Concerning the *ſecond* Opuſcle, *viz.* the Century of his Propoſitions *De Maximis & Minimis*, he affirms, to have written them, for his divertiſement, many years ago. And the *third*, which is a *Short piece of Trigonometry*, he ſaith to have haſtily Compoſed at the ſollicitation of an Ingenious Friend, to ſerve Mathematical Beginners.

IV. *DIALOGI PHYSICI, quorum* Primus *de Lumine*; Secundus & Tertius *De VI PERCUSSIONIS & MOTU*; Quartus *De HUMORIS ELEVATIONE per CANALICULUM*;

Quintus

Quintus & Sextus *De Variis Selectis*. *Auth* Honor. Fabry, *S. Jeſu*, Lugduni Galliarum, 1669. in 8°.

THis Learn'd Jeſuit in thoſe *Dialogues* writeth againſt *Grimaldi*, *Alphonſus Borelli*, and *Montanari*, who in divers things differ from what he hath written: Againſt the *firſt*, concerning *Light*, and that great controverted point, *Whether it be a Body?* And whether *Reflection*, and *Refraction* prove it to be ſuch? *&c.* Againſt the *ſecond* he writeth, about *Motion* and *Percuſſion*, where many things are diſcuſſed; as, Whether motion be *produced*, or *traduced?* Whether the *impetus* of the leaſt Body may move the greateſt Body? Whether the Force of *Percuſſion* be a certain action of Compreſſion in the Impellent Body? What are the Laws of two *Projected* Bodies; equal, or unequal; of equal, or unequal velocity? Whether the Times of the Vibrations of different *Pendulums* are in a ſubduplicate proportion of their Lengths? Whether a Body impelled, being reflected by a Springy and Compreſſed Body, reſtoring it ſelf, be moved and carried back with that *Impetus* only, which it received from the ſame? Whether a Body *Horizontally* projected will at the ſame time come to the ground, as if it had of it ſelf fallen down *Perpendicularly?* Why Bricks are broken by the percuſſions of an Hammer, though they remain whole under the weight of a vaſt and bulky Body? And why an Hatchet cleaveth Wood, whereas a very heavy weight laid on an Hatchet fixed in Wood, doth not? What is the Principle of the Motion of Reſtitution? And many more. Againſt the *third* he writeth, about the *Aſcent of Liquors in ſlender Tubes*; to wit, whether that Riſing proceeds from the Gravitation of the Air, or from its Compreſſion only, preſcinded from its weight? Whether Liquors do riſe equally high, in longer and ſhorter Tubes, but of equal bore? *&c.*

The *Two laſt* Dialogues contain *Miſcellanies*: As, of the *Impetus* innate in Bodies, aſſigned them by Nature to attain their reſpective Ends; of the Gravitation of the Air and its preſſure downwards, to make Vapors aſcend; of the Variety of Motion in Heavier and Lighter Balls moved on Longer or Shorter, thicker or ſlenderer, ſtrings; of new Mechanical Powers; of an Hypotheſis for ſolving the *Phænomena* of the *Tydes* by the Preſſure of the Atmoſphere, importing, that the Tydes do vary according to the inequality, or the various Circles of the Air's preſſure, and the ſeveral Tracts of thoſe Circles, in reſpect of their Scite and Extent; ſo that if all the Circles of that preſſure of the Air were free, that is, if the water did cover the whole Surface of the Earth, it would riſe much higher in the Tydes; (See pag. 406,407:) Beſides, of a Queſtion, Whether in a Ship moved, all the motions of the people carried in it will be made after the ſame manner, as if made in a Ship not moved; Of the 7 Rules of Motion deliver'd by *M. Hugens*, with ſome conſiderations thereon, p. 411; Of the great Compreſſion of the Air, in reference to what *Mr. Boyle* hath publiſh't on that Subject, p. 436; Of the Controverſy, Whether the Mercury in the *Torricell.* Experiment be ſuſtain'd by the external Air, or by a Tenſe matter within; Of the cauſe of the *Glaſs-drops* ſhiver'd in ſmall pieces by breaking off the tail of them, p. 467; Of *Electricity*, p. 475, &c. But whether our Author have the better of thoſe, againſt whom he writes, I ſhall not take upon me to Judge, but leave it to the Reader to think as he ſhall ſee cauſe.

V. *ANTONII MOLINETTI*, *Phil. & Med. Veneti*, &c. *DISSERTATIONES ANATOMICÆ & PATHOLOGICÆ de* Senſibus *& eorum Organis.* Patavii, 1669. in 4°.

IN this Learned Treatiſe of the *Senſes*, the Author begins from the conſideration of the Touch, diſcourſing of the genuin Organ thereof, which he maketh to be the ſoft ſubſtance of the Nerve only.

Next, he treats of the *Sight* and its Organ; where he largely diſcuſſeth the old Controverſy of the manner how Viſion is made, whether by the Reception of the Species or viſible rays of the Object, or by the Emiſſion of the Spirits of the Eye; maintaining the former, and refuting the latter. Then he proceedeth; 1. To ſpeak of the nature of *Light* and *Colours*, eſteeming the diſtinction of Colours into *Real* and *Apparent* to be puerile. 2. To treat of the Three Refractions of the Luminous rays made in the Eye, by the ſeveral humors thereof. 3. To aſſign the different apertures of the Pupill according to the diſtance of the object, and the degrees of its illumination; as alſo the reſpective offices of the Chryſtallin, Vitreous, and Aqueous humors; and the reaſon of their poſition, and configuration, ſages between the medullar Filaments be open'd, or ſhut, and that more or leſs; or laſtly, whether it be, that the Spirits are variouſly diſpoſed, whilſt the *Medulla* of the Brain remains in the ſame ſtate? 7. Diſcourſeth of *Sleep* and *Waking*; where he very curiouſly obſerveth, *firſt*, How far there is in Sleep a Ceſſation of Senſe and Motion; and how *Night-walkings* and *Reſpiration*, (two very ſtrong Motions) are performed in Sleep: *Secondly*, What is the immediate cauſe of that Ceſſation, *viz.* a ſcanty and alter'd influx of the Spirits into the Organs of outward Senſe. 8. Aſcribeth the exact knowledge of the *Medulla Spinalis* to that excellent *Engliſh* Phyſitian and Anatomiſt Dr. *Willis*. 9. Explains the order in which the ſeveral Combinations of the *Nerves* do proceed, out of the Medullar Maſs of the Brain, into and through the whole Body. 10. Concludeth the whole with an Explication of the *Affections* and *Diſeaſes* of the Brain; and ſhews, *firſt*, How the various *Head-aches* are cauſed by the various qualities of the parts that compoſe the Bloud, which being either *bilious*, *ſulphureous*, *ſalin*, *aqueous*, or *terreſtrial*, do accordingly cauſe lacerating, pricking, vellicating, or heavy pains: *Secondly*, How the *Dropſy* of the Brain is cauſed by the copious ſeroſities gather'd between the Membrans of it. *Thirdly*, How *Ulcers*, *Obſtructions*, and *Inflammations* are produced. *Fourthly*, How thoſe many *Perturbations* and *Symptoms* are occaſioned in the Brain, as *Sadneſs*, *Fear*, *Sleepineſs*, *Madneſs*, *Forgetfulneſs*; Epilepſy's, Apoplexy's, among which two laſt he finds this difference, that an *Epilepſy* is not neceſſarily preceeded by any Obſtruction; an irritation and an offenſive afflux to the Senſible parts, being able to produce it alone; whereas an *Apoplexy* never comes without an Obſtruction of the Spirits. *Fifthly*, How *Palſy's* are cauſed, *viz.* by an influx of impure Spirits from the Origine of the Nerves into the beginnings of the ſame. *Sixthly*, How *Overmuch Watching* is occaſioned, namely by over-hot Spirits; as an *Un-natural Sleep* is produced by thick, torpid and cold vapors, intermingled with the Spirits, *&c.*

Errata.

In Numb. 65. *p.* 2014. *l.* 17. *del.* firſt, *and read*, were ſtarted. *Beſides, the Reader is deſired, not to be offended at the overſight of the Printer, who in this ſame Tract of* N. 65; *when he ſhould have numbred page* 2107, *did print* 2007; *whereby ſome confuſion would ariſe in the* Index *that is to follow, if therein the Publiſher did not intend to prevent it in ſome meaſure by quoting as well the* Number *of theſe Tracts as the* page. *In this* Numb. 67. *p.* 2040. *l.* 17. *del.* Farewell.

LONDON,
Printed for John Martyn, *Printer to the* Royal Society.

PHILOSOPHICAL TRANSACTIONS.

Februar. 20. $16\frac{70}{71}$.

The CONTENTS.

An Extract of a Letter, concerning ſome un-common Obſervations and Experiments made of an Acid Juyce to be found in Ants; *recommended to further Enquiry. Extracts of two other Letters, about the Bleeding of* Sycamores. *Some Obſervations about the Variety of the Running of Sap in other Trees; together with ſome ways of ordering* Birch-water, *and a Method of Retarding the Aſcent of Sap, to prevent the too haſty Bloſſoming of Trees, and conſequently the Deſtroying of Fruit. More Inquiries concerning the Motion of Sap in Trees; and ways of Preſerving and Brewing with it: As alſo about a way of Colouring Leaves and Fruit, and the Multiplying of Crab ſtocks, and Propagating Trees by Layers;* &c. *An Accompt of two Books.* I. *MISCELLANEA Curioſa-MEDICO-PHYSICA Academiæ Naturæ Curioſorum* Lipſiæ, 1670 *in* 4°. II. *PHYSICA, in decem Tractatus diſtributa, Auth.* Honor. Fabri, *Lugduni Galliarum* 1669. *in* 4°. *An Alphabetical Table for the* Fifth *Volume of the* Philoſophical Tranſactions *in the Year* 1670.

Extract of a Letter, written by Mr. John Wray *to the Publiſher* January 13. 1670. *Concerning ſome un-common Obſervations and Experiments made with an Acid Juyce to be found in* Ants.

SIR, What I now ſend you concerning the *Juyce* of *Piſmires*, I received not long ſince from Dr. *Hulſe* and Mr. *Samuel Fiſher*. The Obſervations ſent me by *Mr. Hulſe* the tenth of

Auguſt laſt paſt,are theſe. Lately (ſaith he) conſulting *Langhams Garden of Health*, I met with this paſſage: *Caſt the flowers of* Cichory *among an heap of Ants, and they will ſoon become as red as bloud.* Note,that *Langham* was not the firſt,that made or publiſhed this Obſervation: I find it deliver'd by *Hieronymus Tragus Hiſt. Stirp. l.* 1. *c.* 91. *Naturæ miraculum in hoc flore obſervare licet; ſiquidem cumulo Formicarum abditus, Cæruleum colorem in rubrum mutat, ac ſi terrore illarum erubeſceret.* And before him, it was taken notice of by *Otho Brunſfelſius*, as *Johannes Bauhinus* obſerves. I preſently got ſome Cichory flowers, and made the Experiment, and find it to be true what he ſaith; only he takes no notice of the manner,how the flowers come to be ſtain'd: which therefore take as followes. Bare an Ant-hill with a ſtick, and then caſt the flowers upon it, and you ſhall ſee the Ants creep very thick over them. Now as they creep, they let fall a drop of liquor from them, and where that chanceth to light, there you ſhall have in a moment a large red ſtain. Sometimes they will be a pretty while before they diſcolour them, and at other times they will do it ſuddenly. At the firſt I gueſſed, that being vext by ſtirring their hill, they might thruſt their ſtings into the flowers, and thorow them convey that ſharp liquor: But by bruiſing them, and rubbing the expreſſed juyce againſt the flowers, I find they will be equally ſtained. 'Tis a thing well known, that Ants, if they get into peoples clothes, and ſo to their skin, will cauſe a ſmart and tingling, as if they were nettled; which I conceive is done by letting fall the fore-mentioned corroſive liquor, rather than by ſtinging.

To what ſort of liquor to refer this Juyce, I know not. I dropt *Spirit of Salt*, and *Oyl of Sulphur* upon the Flowers, but they did not cauſe them to change colour. * I likewiſe put *Salt of Tartar* upon them, and dropt thereon a little *Spirit of Salt*, which cauſed a ſufficient fermentation, but prevailed not to change the colour of the flowers in the leaſt.

* *See the Poſtſcript of this Letter.*

Spur, This Obſervation holds true not only in *Cichory flowers*, and, I ſuppoſe, all others of a *Blew* colour. It were worth the while to try, Whether that ſharp liquor, which *Mr. Hook* ſaith is in the ſtings of Bees, if it may be got out by thruſting them into the leaves of Flowers, will not cauſe a ſtain. *So far the Doctor.*

Upon reading theſe paſſages, I called to mind an Experiment, which ſome years ſince *Mr. Samuel Fiſher* of *Sheffield* had made me acquainted with, *viz.* If with a ſtaff or other inſtrument you ſtir an heap of Ants, (eſpecially *Horſe-Ants*,) ſo as to anger them, they will let fall thereon a liquor, which if you preſently ſmell to, will twinge the Noſe like newly diſtilled *Spirit of Vitriol.* Conſidering this, and likewiſe that a few drops of the Oil or *Spirit of Vitriol* will ſoon turn the blewiſh *Syrup of Violets* into a bright red; and, as I am credibly informed, the juyces and tinctures of any other flowers or fruits of that or the like colour, I was eaſily induced to think, that this juyce of Piſmires might be of the ſame nature with the Oyl of Vitriol, and other Acid Spirits, (which have in the fore-mentioned reſpects the ſame effects with that Oyl:) And thereupon I ſent to inquire of *Mr. Fiſher*, what Trials he had made of it, who return'd me this following account.

A weak Spirit of Piſmires will turn Borage flowers red in an inſtant: Vinegar, a little heated, will do the like. Piſmires diſtilled by themſelves, or with water, yield a Spirit like Spirit of Vinegar, or rather like the Spirit of *Viride æris.* Lead put into this Spirit, or fair water, with the Animals themſelves being alive, maketh a good *Saccharum Saturni:* Iron put into the Spirit, affords an Aſtringent tincture, and by repetition a *Crocus Martis.* Take *Saccharum Saturni*, thus made, and diſtil it, and it will afford the ſame Acid Spirit again, which the *Saccharum Saturni* made with Vinegar will not do, but returns an inflammable Oyl with water, and nothing that is Acid. *Saccharum Saturni* made with *Viride æris*, doth the ſame (in this reſpect) with that made with Spirit of Piſmires.

When you put the Animals into water, you muſt ſtir them to make them angry, and then they will ſpirt out their acid juyce. No Animal that ever we diſtilled (he ſpeaks of his Brother and himſelf) except this, yields an *Acid* Spirit, but conſtantly an *Urinous*; and yet we have diſtilled many, both Fleſh, Fiſh, and Inſects.

Hitherto Mr. Fiſher, who deſires to be inform'd, whether any ingenious perſon, converſant in theſe inquiries, hath either himſelf found out, or heard of any other *animal*, that by diſtillation or otherwiſe yields an Acid ſpirit. For my part, I know of none; but if any do, they are probably the *favificous* and *gregarious* kind, and generally ſuch as are furniſh'd with ſtings; of which weapon Piſmires are not unprovided. Indeed it ſeems ſtrange, that Nature ſhould prepare and ſeparate in the Body of this Inſect without any ſenſible heat, and that in good quantity, conſidering the bulk of the *animal*, a liquor the ſame for kind with thoſe Acid Spirits, which are by Art extracted out of ſome Minerals not without great force of Fire.

I doubt not but this liquor may be of ſingular uſe in Medicine. *Mr. Fiſher* hath aſſured me, that himſelf hath made trial thereof in ſome diſeaſes with very good ſucceſs.

Poſtſcript.

WHereas in the former account there is a paſſage liable to exception and miſtake, *viz. Spirit of Salt and Oyl of Sulphur, drop'd upon Cichory-flowers, did not cauſe them to change colour*; for the clearing thereof you may pleaſe to take notice, that it is to be underſtood of the flowers entire and unbruiſed: For any Blew flowers being a little bruiſed, and then a drop of Spirit of Salt or any other Acid Spirit let fall thereon, will turn inſtantly red. The reaſon is obvious; for that the leaves of the Flowers (as all the other parts of the plant) being inveſted with a skin or Membrane, the liquor dropp'd thereon cannot eaſily penetrate it, and ſo commix it ſelf with the interiour juyce or pulp. Hence it is, that if theſe flowers be put into cold Vinegar, eſpecially if the weather be cool, they will not change colour for a conſiderable time; but if you heat the Vinegar, they will change immediately.

Whether the Ants do only drop this Tinging liquor upon the ſurface of the flowers, or thruſting their ſtings into the body of the flower, do by them convey it immediately into the interior included Juyce, we cannot yet determine, but refer to future obſervation, when the time of the year will afford us flowers.

Extract of a Letter written by Mr. Martin Liſter *to the Publiſher,* Jannuar. 25. 16$\frac{72}{71}$, *relating partly to the ſame Argument with that of the former Letter, and directing to another Inſect, that is like to yield an Acid liquor; partly to the* Bleeding *of the* Sycamore.

SIR, Concerning the Acid liquor of Piſmires, I have very lately received from Mr. *Wray* the Account (I ſuppoſe you have it alſo by this time,) that was ſent him from Mr. *Fiſher* and Mr. *Jeſſop*; wherein theſe two laſt Gentlemen make this further Inquiry, Whether there be any other Inſect, or Animal, Fleſh or Fiſh, that will afford an Acid Juyce; they having with great induſtry tried many *ſpecies* amongſt Inſects, and other Animals, without lighting on the like Acid liquor. I am of the mind, there are; and a ready way to find ſuch out, may be, that having obſerved, that a Piſmire bruiſed and ſmelt to, emits a ſtrange fiery and piercing ſavour, like the leaf of the Herb, by *Botaniſts* called *Flammula*, broken at one's noſtrils; by this means I have, ſince *Mr. Wray* put the queſtion to me, found an Inſect, which I ſuſpect, may yield an Acid liquor as well as the Piſmire; and that is the *Long and Round-bodied read-coloured Julus*, diſtinguiſhed from all other *Multipeds*, in that their innumerable legs are as ſmall as hair, and white, and in going they are moved like waves; not rare amongſt drier rubbiſh; no *Scolopendra*, ours being an harmleſs inſect, and that armed with dangerous *forcipes*. The body of this *Julus* being bruiſed ſtrikes the noſtrils exceeding fiercely; but I have not yet had an opportunity to furniſh my ſelf with any quantity of them for farther trials. The Change of Colours in Flowers, *&c.* is a ſubject I have a little conſidered, and you ſhall have my thoughts and Experiments about it more at leiſure.

As to the *Bleeding of the Sycamore*; the laſt year I winter'd at *Nottingham*, where I pierced a Sycamore about the beginning of *November*; the turgeſcence of the Buds inviting me thereto, and ſome hopes of improving the notion of Winter-bleedings, ſo happily diſcover'd by *Mr. Willoughby* and *Mr. Wray*. This ſucceeded ſo well with me, that I did afterwards engage my ſelf in keeping a *Journal* throughout the whole Winter; from which Journal, I think, I may note; 1. That the wounded Sycamores never bled, neither in *November*, nor *December*, nor *January*, nor *February*, nor *March*, (which yet they did above 40. ſeveral times, that is, totally ceaſing and then beginning anew,) unleſs there *preceded* a ſenſible and viſible Froſt; for *I* had no other way of recording the temper of the Air. 2. That the Froſt did not always ſet a bleeding the wounds, they found made before they came, though ſometimes they did; but upon their breaking up, or very much relenting, the wounds either made in that inſtant of time, or made many months before, did never fail to bleed more or leſs. 3. That particularly upon the breaking up of the two great and long Froſts (the firſt of which hapn'd that year in that Country to be on the third of *January*; the ſecond, about the 12th, 13th and 14th of *February*,) all the wounds ran moſt plentifully: ſo that ſuch times may be look'd upon as the moſt proper ſeaſon of gathering great quantities of Juyce from this Tree. Removing into *Craven* the latter end of *March*, and thence to *London*, my Journal was diſcontinued; I had yet, upon my return from *London* into *Craven*, ſome leiſure to proſecute it. Thoſe, I there wounded the latter end of *May*, did did not bleed neither the remaining part of that month, nor the following months of *June* and *July*, but had the orifice of the wounds, made with a ſmall Auger, in a manner quite grown up, and would ſcarce admit a Pigeons feather. Wherefore the 30th of *July* I cut out a ſquare piece of about two inches of the bark of a large and well-grown Sycamore, about my hight in the body of it: This wound began to run the next morning about 9 a clock, ſo as to drop; and that was all, and dryed up by 11 in the morning. The like cut I made in a young Sycamore the 8th of *Auguſt*; which in like manner bled the next morning, but ſtopp'd before 9 a clock. It did ſo for 2 or 3 days, but then totally drying. Afterwards removing to *York* the firſt of *November* I here pierced, and otherwiſe wounded two Sycamores; and having obſerv'd them my ſelf at times, when, according to my former Obſervations made in *Nottingham-ſhire*, I might well expect to have found them bleeding; yet they *never* ſtirr'd, that we could obſerve, to this day. Since

Mr. Wray hath aſſured me, that thoſe of *Warwick-ſhire* bled the 16th of *November* laſt paſt copiouſly; and ſince the *Walnut-tree* alſo. And ſo much for matter of fact.

To what cauſe we may truly refer this Anomalous Bleeding, is not eaſie to ſay. For my part, *I* am not apt to think, that there is ſuch a ſudden and extemporary Aſcent of Sap, at ſuch time as theſe Trees are moſt diſpos'd to bleed; but rather, that the Sap, in all parts of the Tree, is ſome ways notably *alter'd* in its temper and conſiſtence: And this Bleeding by ſtreſs of weather may in theſe Trees probably be look'd upon as a violence done to their natures from an unkind Climate; conſidering the *Walnut* and *Sycamore* as ſtrangers, and not natives of England. 'Tis indeed true, there are many ſorts of *Engliſh* Plants, which will bleed in Winter; but note alſo, that ſuch Plants never refuſe to do ſo at any time of the year, no more than a Man, who may bleed a vein when he pleaſeth. But let the Hypotheſis be what it will, *I* am perſwaded, we ſhall have but dark and imperfect notions of the motion of the Juyces in Vegetables, until their true Texture be better diſcover'd. To conclude this ſubject, I now put theſe two *Queries*; 1. Whether the Juyce of Trees, whil'ſt alive and vegete, can properly be ſaid, at any time of the year, to deſcend, or to be wanting in any part, or not to be therein in a much like quantity? 2. What condition the Soil is of, where ſuch Trees are planted, that ſhall either bleed or refuſe to do ſo; whether Sandy, as that of *Nottingham*; or a wet Clay, as that of the two Trees, I have obſerv'd here at *York*?

An Extract of another Letter written by the ſame Gentleman, Mr. Wray, *to the Publiſher, of* Febr. 8th. 16$\frac{70}{71}$. *Containing ſome Experiments about the Bleeding of the* Sycamore, *and other Trees; as alſo, a conſiderable Note of* Pliny *about the* Mulberry-Tree.

Concerning the *Bleeding* of the *Sycamore*, let me acquaint you with the following Experiment. The firſt inſtant it froze, the Wind at *North*; the Froſt and Wind continued (ſome little Snow and rain falling) the 2d, 3d, 4th, 5th, 6th, until the 7th in the morning, when the Wind came about to the South-Eaſt, and the weather broke up a pace. The Sycamores bled not all this while, but the 7th about Noon all Trees of that kind bled very freely, both at the Twigs and Body, and I ſtruck above a dozen.

At this ſame Critical ſeaſon I was willing to repeat the Experiment upon other Trees; and to this end I forthwith ſtruck the *Hawthorn*, *Hazel*, *Wild-Roſe*, *Gooſe-berry-buſh*, *Apple-tree*, *Cherry-tree*, *Blather-nut*, *Apricock*, *Cherry-Lawrel*, *Vine*, *Walnut*; yet none bled but the laſt-named, and that faintly in compariſon of the *Sycamore*. This is conſonant to our former Experiments: And if it did happen (as I ſaid in my former Letter,) that theſe Sycamores bled not all this Winter afore at the wounds made the firſt of *November*, I do now think, that if new wounds had been ſtill made at every break of Froſt, ſome ſignes, at leaſt of our *York-ſhire* bleeding, might have been diſcover'd before now. But *I* affirm no more, than *I* have ſeen and tried.

In all the Monuments of the Antients, collected by the great induſtry of *Pliny*, *I* find but few inſtances of this nature. Amongſt thoſe few, there is one that is regiſtred with two or three remarkable circumſtances to our purpoſe. He tells us, that the Phyſitians of old, when they had a mind to draw the Juyce of the Mulberry-tree, were wont to ſtrike it skin-deep only, and that about two hours after Sun-riſe. This Experiment is twice mentioned by him, and in both places as a ſtrange *phænomenon*. We might make our Comment upon the places, but for this time are content only to tranſcribe the Texts. *Lib. 16. c. 38. Mirum; hic (cortex) in Moro, Medicis ſuccum quærentibus, ferè horâ diei ſecundâ, lapide incuſſus manat, altius fractus ſiccus videtur.* Lib. 23. c. 7. *Mora in Ægypto & Cypro ſui generis, ut diximus, largo ſucco abundant, ſummo cortice deſquamato, altiore plagâ ſiccantur; mirabili naturâ.*

Some Obſervations concerning the Variety of the Running of Sap in Trees, compared with a Weather-glaſs; made in April, 1670. *Together with ſome ways of ordering* Birch-water: *By Dr.* Ez. Tonge.

I Am this day very much confirmed in my apprehenſion, that Trees and other Plants, if we could contrive them, as I have

(but ſlenderly) projected in my *Sap-wiſer* to that purpoſe, would far better indicate the Alteration of Weather, as to heat, cold, moiſture, drought, than any Weather-glaſſes, I have yet experimented. For my Weather-glaſs continuing at one and the ſame ſtation, in a manner all this day (*April* 13.) my Trees have altered their temper ſo much, that 24 of them, that ran tolerably this fore-noon, yield not a pint of Sap this afternoon; and though one of them ran moſt part of the day, the reſt ceaſed about one or two of the clock in a fair clear Sunſhiny ſeaſon, retarded (ſo far as I could obſerve) only with a Weſtern wind; though that be reputed mild and cheriſhing.

Theſe Trees ran above two quarts in the morning. The Weather-glaſs continues the ſame, *viz.* about 11 inches water, theſe two days. *Thurſday* the 14th, it was 9½ only. *Friday* the 15th, my Weather-glaſs at noon was advanced from 9 to 10½, yet the quantity of Birch-water this day exceeded my former from theſe Trees; for I had above 2½ quarts before noon.

But for cold, I find, that the Air, when any whiſling blaſt of cold wind ſtirs, ſtays my Birches. I want a Wind-fane.

I would deſire by the by, that people would try with Mints and other hot, balſamick or aromatick herbs or roots, and eſpecially with *Roſemary*, put into their Bottles filled with Birch-water from the tree, to preſerve it, and to brew Ale with it. I had very fine and warming drink from a few ſprigs of Roſemary ſteep'd in Spirit of Wine; I purpoſe to try *Elecampane*, and roots of the like kinde.

Saturday, the 16th, theſe 24 Birches began to run preſently after Sun-riſe, and ran about 3 quarts, and ceaſed about two a clock after noon, having till then continued to run. *Sunday*, the 17th, it rained, ſo that we could make no Obſervations what Sap theſe Trees might ſpend; neither did Rain and all amount to much above a Gallon and a half. *Munday* the 18th, they ran until Noon. *Tueſd.* and *Wedneſ.* the 19th, and 20th, wherein was expected greater ſtore of Sap, after the Rain, the Trees ſpent not a drop. *Quere*, Whether it be from their buſie protruding of their leaves upon the rain? (of which yet there was then no appearance;) or the over-cooling and moiſtening of the Roots, by plenteous Rain? *Saturday*, the 23th, my Weather-glaſs ſtood at 7½, it being a Rainy and boiſterous morning, the Rain not allaying the Wind. At 9 a clock of that fore-noon, my

Birch water worked in the Barrel *per ſe*: Which ſeems to verifie Mr. *Souton*'s relation from his Brother, a *Swediſh* Merchant, importing, that Birch-water in *Sweden* worketh alone; (perhaps collected in great quantity.) Only *I* put a very few Cloves into my Sap. Boiled to a third or leſs, it keeps well, eſpecially when boiled with the buds or ſprigs of the ſame Tree, as I have been informed.

April 16, 17, 18, in the year 1670. Birch-ſap mixed with Rain-water at the Tree, fermented, with *Roſemary*-ſprigs ſteeped in Spirit of Wine: which warmed the ſtomack as ſtrong Wine, and pleaſed the palate; though the taſte in the mouth was ſomewhat wateriſh.

A Letter written by the ſame Dr. Tonge, *to the Publiſher; about the Retarding the Aſcent of Sap, together with ſome other Queries relating to that Subject.*

SIR, laſt night Sir *R. Moray* did me the favour to acquaint me in diſcourſe with ſome particulars about the Gathering of Sap in Fruit-trees, and the Retarding the Aſcent thereof; which he had received from an eminent Planter in *Glouceſterſhire*: Concerning which, *I* thought it fit to communicate ſome Reflexions of mine; which you may diſpoſe of, as you think good.

It was propounded to me by way of *Quere*; How to gather every drop of Sap that ſhould riſe in any Fruit-tree? This, I ſaid, I thought not feaſible, by what I had experimented hitherto. My grounds were theſe; *Firſt*, in thoſe Trees, whoſe Sap ſeems to be of a Gummy nature when condenſed, as Plums, Cherries *&c.* I knew no Experiment, by which any drop of Sap could be collected. And I ſuſpect, ſome other Fruit-trees to be of that nature, whoſe Sap I could not draw out at any ſeaſon, of hot or cold weather, though they have not been obſerved to yield any Gum. Perhaps there may alſo be ſome Fruit- and other Trees, whoſe Saps are viſcous, though not Gummy; and theſe, I doubt, will not yield any Sap to be gather'd in any common or known way.

Secondly, it ſeem'd to me not feaſible, to gather all the Sap of thoſe Trees, whoſe Juyce is fluid and plentiful, and condenſeth into a gelly, becauſe it ſeems at moſt ſeaſons of the Year to aſcend imperceptibly; and that not only in the outward, but innermoſt parts and pores of the Tree; not only betwixt Bark and Wood, but betwixt every coat of the Wood, and even through the moſt ſolid parts of each Coat; as *Mr. Willoughby*'s Obſervations have diſcover'd, * unleſs I miſtake.

The Experiment of the ſaid *Gloceſter-ſhire* Planter, by which he hoped to gather all the Riſing Sap of Fruit-trees, was made, by binding the Trees round about very cloſely and ſtrongly with cords, ſo as to intercept what riſeth 'twixt Bark and Body; he being of opinion, that no conſiderable quantity riſeth in any other part. To which I oppoſe, beſides what was ſaid juſt now, that ſome Trees will live though they be disbarked in ſome place quite round; eſpecially if this be done in ſome ſeaſon, when the blaſting Winds ſtir not; which *I* have elſewhere diſcourſed of in my Letters to Sir *R. M.*

Mean time, though this Planter ſeem to me to miſtake in the Riſing of Sap, yet he maketh it up by diſcovering to us, that ſuch Tying of Trees retards their Bloſſoming and Bearing; and ſo may in ſome years (as this preſent, in which the open weather haſtening bloſſoms, is like to deſtroy the fruit) prevent a ſcarcity of forward fruit, uſually nipped by the late Froſts.

Upon this diſcourſe *I* ſhall take leave to ſuggeſt theſe following Inquiries:

1. Whether two Trees, running, when both are free and untied, equal quantities of Sap at like orifices of equal breadth and depth, will run unequally, when ſtrongly tied; and if ſo, what will be the difference?

2. Whether the ſaid Trees will run unequal quantities at equal orifices made in *Roots*?

3. Whether the delay of Sap, ſtaying Fruit and Bloſſoms, as is ſuppos'd, by tying, will cure the *Phyllo-mania*, as Croſs-hacking?

4. Whether a Tree kept wholly from bearing this year (its uſual bearing year) will bear the next, and ſo to better advantage, when fruit is ſcarce?

5. Whether by this way, Trees may be brought to bear at other ſeaſons, than yet hath been practiſed?

6. Whether tying of Trees, made before Mid ſummer, cauſeth the Bark to ſwell *under* the Ligature, and after Mid-ſummer, *above* it? and whether equally, or by what different proportion?

---

* See *Numb.* 48. *p.* 964.

7. Whether it will direct Sap to inoculated Buds, if the contrary ſide only be ſtopp'd by ſtrong binding?

8. Whether in paring the Bark quite round, or in part, covering the bare place with Lome, the ſame or like effects will follow?

9. Whether, in caſe the Bark above the Ligature ſwell moſt, it be to be attributed to the Sap deſcending, or to the permeableneſs of all parts of Plants by their Sap (as reſembling Bloud and other Humors in the Body,) which more readily deſcends than aſcends to heal the wounded part, or to ſupply intercepted nouriſhment?

Some further Inquiries, made by the ſame Dr. Tonge, *concerning the Running of* Sap *in Trees; the keeping of ſuch Sap, and brewing with it; a way of colouring of Leaves, Fruit*, &c. *As alſo about multiplying Crab-ſtocks, and propagating Trees by Layers*, &c.

1. WHether any Tree, that ran not at Noon in a clear and equally tempered day, ran the ſame day at night, or in any cooler part of the ſame day?

2. Whether a Tree, which gave over running the former day before night, ran the very next day all day and all night, at any trial?

3. Whether Trees beginning to run one day (ſuppoſe one hour) do at any time or ſeaſon of their running, the weather ſtill favouring them in their ſeaſon, encreaſe the time of their running, and ſo proceed gradually and conſtantly to their longeſt term; and whether they go on to run all night at laſt?

4. Whether Trees may then, and only then, be ſaid to be in their beſt ſeaſon of running, when they will run in the night or till the Sun-ſet? And when that ſeaſon is? and in what Trees? And whether then, and at that, or what ſeaſon, it be beſt to gather Sap for uſe?

5. Whether Trees are not ſometimes ſo full of Sap, that a greater quantity may by a large orifice, or many orifices, be drawn from them, than did riſe in them the ſame day? If ſo, then that caſe muſt be diſtinguiſhed from another caſe at an other time, wherein Sap riſes as well as runs all day, or all day and night, though ſlowly: And conſequently in all Experiments, the riſing and running of Sap muſt carefully be diſtinguiſhed, and it muſt be noted, when Sap runs of a ſtock of that liquor

former

formerly riſen, and when it runs only as it riſes?

6. If Sap do reſtagnate in any Trees at ſome ſeaſons, more riſing and remaining in them, than they digeſt? When that is? In what Trees? And how long it laſts? And how to be obſerved and found? Whether Sap ſo reſtagnating, be better digeſted, and fitter for uſe, being fermented, and inſolated, as it were, by moroſe expoſure to the Sun, or be thicker and clammier, and more near a gelly and unfitter for uſe?

7. What conſtant expoſure to the Sun in Bottles, corked or open, of Glaſs or Stone, operates in Sap? [*I* kept ſome in a large retort of 2 or 3 gallons, expoſed night and day (without any other ſtop than the obliquation of the Retorts neck, and a little paper to keep out Inſects,) many months, and it contracted a Coat on it's top, and the taſte pleaſing my palate; *I* adventured to brew with it at Cider-ſeaſon, and made a great quantity of good cordial drink with 8 Buſhels of chopt Apples, brewing them like Malt with hot water, and putting my Juyces and Saps into my water-Cider at the latter end of their boiling: *I* filled a Stand with it, which contained half the quantity of the largeſt Rheniſh-wine Veſſel, *viz.* about 40 gallons, as *I* remember. *I* had not half Sap in this liquor (the greateſt part of my Brewing being made with water) yet *I* got five buſhels and more of warming Cordial and pleaſant drink for every buſhel of my Apples: if it had been all Sap, it would have been much more cordial and ſtrong: There was in it a conſiderable quantity of juyce of Borrage-roots and herbs (at that ſeaſon uſually thrown out of Gardens,) which Borrage-liquor works and purges it ſelf when tunned, and turns into an excellent clear brown colour; and it may be tried, whether it may be brought to be a potable, pleaſant and wholſom drink alone, or with eaſie brewing with Ale, Cider or other liquors, apt to ſower, if it prove ſo (as *I* ſubmit to Inquirers,) that Borrage-liquor reſiſts Acidity in drink, (as the herb in flower and in ſubſtance is ſuppoſed to do,) and ſwims above water, Cider, or, when it's mixt with them, in gentle boiling doth preſerve them. I drank my drink the Eaſter following: So my Sap gathered at Spring, brewed about Michaelmaſs, continued good till Eaſter and after it.]

8. Whether a Glaſs, fitted to both ends of a Root, ſo divided, that there remain a diſtance of half an inch from that part

left adhering to the Tree , and that growing in the Earth, (which Glaſs I call my Sap wiſer;) will be and continue always full of Sap, or only whileſt the Tree runs, or how long? And when? *Quære*, whether this Glaſs muſt be *cemented* on to both ends of the Root, before the Root runs;or whether it be better to put it on gently,and not too firm and cloſe,ſo as to exclude the Air?

9. Whether Saffron infuſed in Sap, or other tinging moiſtning Bodies, put into ſuch a Sap-wiſer, will tinge the whole Tree, wood, leaves, fruit, *&c.* or any of them? Or by the like infuſion in bored arms of any Trees have the ſame effect?

10. Whether by a Sap-wiſer the motion of Sap in Apples, Peares,and ſuch like other Trees , whoſe Sap is too ſubtil or too ſlow in motion to be otherwiſe diſcerned , may be obſerved, and be tinged?

11. If any Pear, or Apple, or Quince; may be made bloud-red by grafting on a Mulberry-ſtock? And whether being after removed to another, ſuppoſe a Quince-ſtock,it will retain its colour, and all Grafts taken from it alſo?

12. Whether Sap may by a Sapwiſer be transfuſed out of one Tree into another; and if ſo, what it will work?

13. Whether grafting, chamfering, indenting tong-wiſe, or inoculation well cloſed and waxed, will ſucceed in the Root, and whether in that part of a Root , which is cut off from the Body,and remains in the Earth? Whether grafting, inoculating, *&c.* in root and ſtock, be beſt , when the Sap is running, or before, or after running? Some affirm, that the dividing of Crab-ſtock Roots, from the ſtem left in the ground,is the beſt way of multiplying Crab-ſtocks , or a commendable one at leaſt?

14. Whether Crab- and Apple-kernels ſown in indifferent or barren ground,and weeded ſome years(after that the hopefulleſt ſpare Roots of the largeſt of thoſe are removed with the ſtocks for uſe,) the other Roots of leſſer ſize ſeparated from the ſtem being left in the ground , after 3 or 4 years growth or more (then come to be of half an inch diameter,) each Root thus carefully left in the ground with the top not bruiſed, but cut ſmooth, even, ſlope,and waxed, raiſed to the day only, may grow into a new Plant, or be inoculated, packt and grafted? and how ſoon?

15. Whether the Nature of Saps aſcending, or the Cauſe of of it, be after this manner; *viz.* That in the moiſt night, the Roots being ſpungy and ſoft in the extreme parts, draw in moiſture and ferment it; to which the Sun by his warmth gives farther fermentation in the Roots, and a pulſion upwards into the firmer parts of the Roots, and thence into the Body and Branches, and there digeſteth it? And whether by the ſame manner, the Body and Branches warmed, and exhauſted in the day by the Suns heat, digeſting and expending into leaves, *&c.* according to the ſeaſon, draw Sap out of the lower part to the extremities, ſo that when Digeſtion, or *Suction* (if there be any ſuch) exceeds *Pulſion*, Sap runs not, *& vice verſa*?

16. If Spungy and ſoft wood imitates Roots in their manner of ſhooting freſh Roots, and in the growth, after the way above mentioned?

17. Whether more ſolid wood, as Bays, *&c.* in moiſt and ſeaſonable weather laid, and fitted, or, as it were grafted in Willow-roots or ſticks, will ſhoot Roots in Layers, and grow as Mulberries do? [I have heard that a chip of ſoft wood, laid to the end of a *Bay*-ſlip, promotes its rooting: And that *Mulberry*-ſlips are eaſily propagated, ſet in the latter end of *January*, or beginning of *February*, in a moiſt ſeaſon, not in dry *March*. Such ſlips root beſt, if they be Suckers, and taken off with part of the old bark; or if they be laſt years ſhoots, cut off from Arms, taken with ſome older bark from the place where they ſhot out. I have ſet many formerly, which all throve. I affect to propagate them for Pear, and other ſtocks, namely Quinces, Medlars, Plums, to turn their pulp and juyce red, by taking grafts from ſuch Trees, as have been grafted on Mulberries. *Quære*, if bloud-red Pears and red Redſtrakes were thus raiſed at firſt, or may be propagated, and to what advantage?]

18. *Quære*, if Quince-ſtocks conduce to make firm the pulp of Apples, and alter the form of them from what the Graft naturally had before?

An Accompt of two Books.

I. *MISCELLANEA Curioſa MEDICO-PHYSICA Academiæ Naturæ Curioſorum.* Lipſiæ 1670. *in* 4°.

THis is a work very lately begun in *Germany* by a Company of ingenious Philoſophers, call'd *Academia Naturæ*

Naturæ Curioſorum (an Academy of Curious Inquirers into Nature,) which ſome years ago have eſtabliſh'd themſelves in that Country, with a deſigne chiefly to improve *Phyſick* and *Natural Philoſophy*. For which purpoſe, they have, (as I find in their *Salve Academicum*, printed at *Leipſick*, *An.* 1662.) undertaken each of them, to conſider and write upon determinate ſubjects, thereby to penetrate into the nature and qualities of *Particular* Bodies (*Generals* having too long already buſied Mens Brains and Hands;) as of the *Vine*, *Tobacco*, *Aloe*, *Scurvy-graſs*, *Wormwood*, *Scorzonera*, *St. Johns Worth*; *Iron*, *Braſs*; the *Unicorn*, the *Stagg*, *Crabbs*; the *Bloud-ſtone*, *Eagle-ſtone*; *Muſc*, *Civet*, *Amber*, &c. Beſides which, they have attempted, (after the way, taken up in *France*, *Italy*, and *England*,) to write and publiſh *Ephemerides*, or a *Diurnal*, or *Tranſactions* of a Philoſophical Nature, intending therein to preſent the Curious yearly with ſuch *Medical*, *Anatomical*, *Botanical*, *Pathological*, *Chirurgical*, *Therapeutical*, and *Chymical* Obſervations, as they ſhall by their correſpondence either with the Phyſicians and Philoſophers of their own Body and Nation, or with thoſe of other Societies and Countries, procure and digeſt. And of this they give a *Specimen* in the Book, of which an Accompt is now to be given, out of that *Exemplar*, which was ſent from that Generous Body by the hands of the Learn'd Dr. *Sacks*, (a Member of the ſame) to the Publiſher. In it are contained 160 Obſervations, and 19 Tables of *Figures*; being the Sum of what they have collected for the firſt Year, which is 1670.

Of them we ſhall Engliſh, for a taſt of the Curious here, what followeth; obſerving the promiſcuous way of recital, which is in the Book it ſelf. Among others then (till more Copies of the Book come over,) we take notice of:

1. A Relation of *Snakes* kept tame in an Houſe, going into their boxes every night, and ſeen to caſt their ſkin, and (one of them) to lay 13. Eggs in the ſpace of an hour and a half, facilitated by him that kept them; who alſo diſſected one of them, and communicated the remarkable things in that Operation.

2. An Hiſtory to evince, that part of the *Chyle* is by the *Ductus Thoracicus* conveyed into the *Subclavials*, and ſo into the Ciſtern of the Breaſts, whence by certain Pipes it is carried into the *Glanduls* or Kernels, there to be elaborated, either for the

aliment of the breaſts themſelves, or the food of *Fœtus's.*

3. An Obſervation of a *Polygonum Cocciferum*, or a *Grain-bearing Knot-graſs* in *Poland*, whoſe Grains being expoſed to the Sun, are turn'd into live Worms, which when dried and ſo moiſtned, and pulverized, tinge with a *Crimſon* colour.

4 A Deſcription of an Anti-pleuritick Medicine, (much uſed and commended by *Petrus a Caſtro*, formerly chief Phyſitian to the Duke of *Mantua*) made of the Rindes of the longer ſort of *Italian-Pumpions*, boyled in very old Oyl of Olives, and ſtrained through a ſleeve.

5. A Deſcription of a Remedy for an Atrophy of the Eye, lighted upon by chance, when the Eye of an *Uro-gallus* (or *Cock of the Wood*) being diſſected, the Aqueous humour, by a deep inciſion thereof, did ſpirt into the Eye of the Operator, who thereupon found the pains of his Eye, which was much dried, and did ſmart by over-much lucubrations, aſſwaged, and his ſight improved; and afterwards upon occaſion did adviſe to inſtil the like juyce of ſuch and other Cocks into the Eyes of a young man, who by his debauches had purchaſed a kind of Conſumption in his Eyes.

6. A Narration of a Serpent petrified in the ſtomack of a Stag; kept in the Repoſitory of the Count of *Hanow*, approaching to the colour of a Bezoar-ſtone, and weighing about 23 ounces. As alſo of the Brains of divers Oxen turn'd into ſtones.

7. An Accompt of an Horny ſubſtance grown out, near the two laſt ſhort Ribbs, to a conſiderable length, reſembling the Horn of a young Deer. Whence occaſion is taken to relate many odd Obſervations of Horns grown in all ſorts of Animals, Birds, Fiſhes, Four-footed Beaſts, and even in ſome Men.

8. A way of making a Perſon born Deaf to hear, by ſpeaking to him over the *Coronal ſuture*, well ſhaved and waſhed, after certain Purgations made of the Brain, ſpecified in the Book.

9. Of an Egg naturally bred in an Egg; of Stones naturally found included in Stones; and Animals in Animals, and Fruit in Fruit.

10. Of a Child born Hydropical; and of a *Fœtus* febricitant whilſt in the womb, as was judged by certain red and livid marks appearing on it when it came forth.

11. Of a Child, one year old, ſo diſeaſed with the *Hydrocephalus*, that when open'd, there were taken out of his Head 36 ounces of clear, but ſaltiſh, water; whereupon the Brain was by the attentive beholders ſeen ſo flatted and extended, as to ſtick cloſe to the convex ſides of the whole skull, like ſome thick membrane: There being alſo found a conſiderable quantity of the like liquor within the Cheſt of this Infant.

12. Of Worms let out by Venæ-ſection, and Urine.

13. Of the *Periodical* Head-ach, recurring daily at a certain hour in the morning, and laſting until noon; and ſeizing only the external part of the face over the right Eye; remedied by letting of bloud, and compreſſing the part.

14. An Obſervation of the plenteous growth of *Vincetoxicum* or Swallow-wort in the Counties of *Stiria* and *Carinthia*, moſt inhabitants of which are troubled with the *Scrofulæ* or Kings Evil, curable with the root of that Plant, having in it very Volatil, piercing, and diſcuſſing Spirits; upon which account, the Author eſteems it alſo very powerful againſt Dropſies.

15. Of a *Fœtus* tinged yellow by Saffron in the *Uterus*, related by *Amatus Luſitanus*, and verified here by an Experiment made upon a Bitch big with Puppy's; though the Chyle in the Lacteous Veſſels was whitiſh.

16. Of ſeveral Stones come away together with the Bloud of a man of 72 years of Age, being blouded in the Arm.

17. Of a ſort of *Crafiſhes*, which taſte bitter when boyled; taken in a ſmall River called *Obra*, in the Confines of *Sileſia* and *Polonia*, there growing on the Bank of that River great ſtore of wild *Calamus Aromaticus*, on the Roots of which theſe *Crafiſhes* have been obſerved to feed greedily.

18. Of a Flame broken out of ſeveral ſtomacks, and burning like Spirit of Wine, both in dead Animals, and living Men.

19. A way of Dwarfing men, by anointing their Back-bones, in their very infancy, with the greaſe of Moles, Batts, and Dormice; together with an Intimation of the Art, uſed at *Bononia* to dwarf their Dogs, by often waſhing (from the firſt day they are pupp'd) their feet and back-bone; thereby drying and hardning thoſe parts, and ſo hindring their extenſion.

20. An Abſceſſe in the *Abdomen* well cured at *Vienna* by an inciſion made about 4 inches under the ribbs, upon which fol-

lowd a plentiful eruption of purulent matter, which continued to run for many weeks.

21. Of many odd Examples, not of women only, but men alſo, greedy to eat very ſtrange things; eſpecially of a Boy, that, without any viſible prejudice to his health, did eat Sand, Chalk, Brick, Snuffs of Candles, Dirt, *&c.* though his Mother had not been obſerved to eat any ſuch thing, when ſhe bred him. To whom may be joyned the ſeveral devourers of Glaſs, Stones, and Nails, innoxiouſly voided again by ſiege.

22. Of making *Chylous* Wine, without any diſeaſe in the Kidneys or Bladder, in an Atrophy of the whole Body, there wanting no paſſages, by which the Chyle may come into the Emulgent and Urinary Veſſels.

23. Of an *American* Aloe, planted in *Sileſia*, and remaining ſteril for 31 years, but after that time ſhooting out very many branches, and flowers: its chief ſtem 18 foot high, bearing 21 branches, whereof ſome had above 200 flowers, which together with the main ſtem withered away. And of ſuch an other, in *Miſnia*, which in a few days grew up to the height of 12 inches, growing every natural day a whole palm, and ſhooting out 32 branches, in an admirably regular order diſtant from one another, and in their extremities each producing ſtore of flowers variouſly coloured.

24. Of two rare Symptoms about the Sight. *One* of a perſon, that tuning the ſtrings of a Muſical inſtrument, one of them ſnapping aſunder, hit his right eye with a ſmart ſtroke; after which, ſome proper cooling Ophthalmicks having been applied, the Patient after Midnight awaking, ſaw all things, in the dark, as clear as if it had been full day, being able to diſcern the ſmalleſt lines of pictures, and to read printed papers: Whereas when a Candle was brought to him, or in the Sunſhine, he could ſee nothing at all. The other is, of a man infected with the *Lues Venerea*, who, after that the other ſymptoms were abated, found his ſight ſo diſtemper'd, that all Objects appear'd to him *double*; which yet at length ceaſed.

25. An Obſervation of a *Muſcus Terreſtris* (Ground-Moſs) which being gather'd in *Auguſt* and *September*, and reduced to powder, fulminateth, when held or blown into a flame; the ſame is ſaid by *Olearius*, in his *Moſcovy and Perſian Voyage*, to be uſed by thoſe people in their Artificial Fires; who adds,

that Powder of *Roſin* doth the like.

26. Of a Noble-man in *Sileſia*, who was ſo ſtrong, that with his hands alone he could break a Horſe-ſhoe, and a Ryxdollar; and hold, at one and the ſame time, three Men, two under his Arms, and one by his Teeth faſtned in his cloaths: who once alſo, when he hunted the Wild Boar, one of thoſe Beaſts of a good bigneſs ruſhing upon him, took him with one hand by the hair under the Snout, and with the other hand ran him through with his Sword. This ſame perſon could at one dinner drink off a whole *German Ohm* full of Wine.

27. Of a *Bezoar-ſtone* encompaſſing a Dart, found in the *Emperours* Repoſitory, and eſteem'd to have been taken out of a Bezoar-breeding Goat, which being ſhot in ſome fleſhy part with an arrow, the Salin-Tartareous particles, ſwimming in the Bloud of that Animal, and wont to breed Bezoardick ſtones in it, were by the continual motion of the Bloud carried to that part, where they gathered and ſtuck about the Arrow.

28. Of Eeles being Viviparous, one of theſe *Academicians* affirming, that himſelf had in *Holland* taken ſeveral of them out of an Eels womb, wrapt up in ſeveral membrans.

29. Of an Hermaphrodite-Stockfiſh, having both Melt and Rowe; as alſo of two Crocodils, of both Sexes.

30. Of a ſtrange Antipathy to Muſick in a man, that as ſoon as he heard an Harp touch'd, could not hold his water, *&c.*

31. Of Light inbred in the Inſect, call'd *Scolopender*, ſhining in the dark, and ſparkling when compreſſed.

32. Several Obſervations concerning the *Milk diet* againſt the Gout, together with a debate upon that ſubject; and the manner of uſing the ſaid Diet.

33. Of *Mercury* crowded into the Crural Vein of a Dog, to the quantity of half an Ounce, without any hurt appearing in the Animal.

34. Of a Jaſpar-ſtone, worm eaten.

We leave here unmention'd many other curious Obſervations, related in this Work, partly for want of room, partly becauſe of the unfitneſs of many of them to be expoſed to the view of all ſorts of Readers.

II. *PHYSICA, in Decem TRACTATUS DISTRIBUTA, Auth. Honorato Fabri*, S. J. Lugduni Galliarum, 1669, in 4°.

Of this vaſt work, the Author publiſh'd *An.*1666. at *Paris* two Treatiſes; the firſt, *De Plantis & Generatione Animalium*; the latter, *De Homine*; by a kind of Retrograde method, oppoſing the Order of *Publiſhing* to that of *Compoſing*: For, whereas in the *Compoſition*, he proceeded from the ſimpler things to the Complexed; in the *Publication* and Communication, he thought fit to produce the *Whole* of all Nature, that elaborate piece, *Man*; in whom, beſides the Senſitive and Vegetable Faculties, and the powers of Mixts, and the Elements, common to all Bodies, there ſhineth out a ſupereminent Principle, the Rational Soul.

In the Book, which beareth the above-mentioned Title, the Author giveth in the *Preface* an Accompt of the Method, uſed by him in this whole Work, and of his Performance in this very Volume.

Concerning his Method, he ſaith, That he hath comprehended the whole Phyſicks, or all Natural Philoſophy in *Ten* Treatiſes, in a *Geometrical* method, (which how he performeth, we leave to ſtrict Mathematicians to judge;) beginning from thoſe things that firſt incur into our ſences, *viz.* In the *Four* firſt Treatiſes, he handles of The ſenſible *States* of Bodies, as the Corporeal *Quantum*; Of Bodies Tenſe and Compreſs'd, *Rare & Denſe*, Heavy and Light, where of the *Motion* of Bodies, Natural, Violent, and Mixt; Opack & Diaphanous, Wet and Dry, Hard and Soft; Tough and Dry; Flexible and Stiff; Fiſſil and Brittle; Friable and Ductil; Liquid and Liquable; Inflammable; Exhalable; Spirable; Of Heat, and Cold; of Light, Colours, Sounds, Odors and Taſts; and of the Reſiſtence of Bodies.

In the *Fifth*, he treateth of the Principles of Bodies Natural, of their Generation and Corruption, and the Four Elements.

In the *Sixth* and *Seventh*, of Mixtion and mixt Bodies, Imperfect and Perfect.

In the *Eighth* of Celeſtial Bodies.

In the *Ninth*, and *Tenth*, of Plants, Animals, and *Man*.

As to his Performance in this Volume, he therein diſpatcheth the *Four* firſt Treatiſes. In the whole, he profeſſeth to have followed the Principles of *Ariſtotle*, except where clear Experiment and Demonſtration neceſſitate to recede from him; obſerving withal, how much that Philoſopher hath been perverted by *Averroës*, and the reſt of that *Arabian* Crew.

An Alphabetical TABLE

Of the chief things contained in this Fifth Volume for A. 1670 The *firſt* figure relates to the *Number* of Tracts, the *Second* to the *Page*.

But *Note*, that from the Page 1197. Numb. 58, and again from the Page 2107. Num. 65. The Numbers of Pages are miſprinted: The *Index* refers to the Pages as they are Printed: And the *Number* of Tracts will ſecure the Directions.

A.

AGRICULTURE. The Spaniſh Sembrador, or New-Engine for Plowing, equal Sowing and harrowing at once, with the Deſcription, Uſes, &c. N. 60. p. 1055.

Air: the ſame Quantity may change its Dimenſions to an almoſt incredible degree. How both Carteſians and Epicureans are concerned in this matter. 67. 2052. 2053.

A piece of yellow *Amber* ſo ſoft as to receive the impreſſion of a Seal, and ſtrong-ſented, 64. 2061. See more 66. 2028.

Anatomical Obſervations of the Virſungial Channel inſerted in the Spleen. The Lacteous veſſels apparent in a drowned Body, and two odd Births, by Signior *Jacomo Grandi*, 58. 1188. A fuller Diſcovery of the Veſſels which convey the Chyle to the Breaſts of nurſing women, and that there is a ſuſpicion of another paſſage of the Urine to the Bladder, than by the Ureters, 65. 2083. and 67. 2045. and *Laurence-Bellini* his undertakings in *Anatomy*, offer'd to the G. Duke of *Toſcany*, 65. 2093. See *Monſters*.

Aſtronomy: Mr. *Mercators* conſiderations concerning the Geometrick and direct method of Signior *Caſſini* for finding the Apogees, Excentricities and Anomalies of the Planets, 57. 1168. A new Star appearing in the Swan, Aug 17. 1670. and the preſent Appearance of the Planet Saturn, obſerved by M. *Hevelius*, and others, 65. 2087. and 66. 2023. The Moons Eclipſe Sept. 19. 1670. the Conjunction of Venus and the Moon Oct. 2. 1670. with remarks on the new Star in the Beak of the Swan, and on the other in the Neck of the Whale, M. *Hevelius*, &c. 66. 2023. &c. Mr *Flamſteads* Pre-advertiſements of the Moons motions this following Year. 66. 2029.

B.

CONcerning the *Bathes* in Auſtria and Hungary, by Dr. *Edward Brown*, 59. 1142.

Bees or inſects of the Bee-kind, how generated by Bees in Willows, 65. 2089. and 2100.

Books of Note abbreviated. *Joh. Amerpoel* Carteſius Moſaizans 59. 1053.

Anonymus. The Divine Hiſtory of the Geneſis of the world explicated, and illuſtrated 60. 1083.

Fr. *Bayle* de Cauſis fluxus Menſtrui Mulierum; & de Sympathia Variarum Corporis partium cum Utero; & de uſu lactis ad Tabidos reficiendos, &c. 64. 2074. His vindication of *Des-Cartes*, with *Fourneillis* on the ſame annexed and Engliſhed. 62. 2034.

Lud. de *Beaufort* Coſmopœia divina. 59. 1052.

Mr. *Boyles* Introduction to the Hiſtory of particular Qualities: Of Coſmical Qualities and *Suſpicions*: The Temperature of the Subterraneal and Submarine Regions: The Bottom of the Seas 63. 2057. His Origo Formarum & Qualitatum Latinè reddita, 66. 2034. His Diſcovery of the Admirable Rarefaction of the Air even without Heat: New Obſervations about the Duration of the Spring of the Air: New Experiments touching the Condenſation of the Air by meer Cold; and its compreſſion without Mechanical Engins: and the Admirably differing Extenſion of the ſame Quantity of Air Rarified and Compreſſed, 67. 2052.

Fr. Joſ *Burrhi* Epiſtolæ duæ ad Thom. Bartholinum de Cerebro; & de modo ſanandi oculos 64. 2081.

Pietro *Cavina* Conjetture Phyſico-Aſtronomiche della natura del Univerſo, 65. 2012.

William Cleark of Nitre, the Nature, Generation, Place, Artificial Extraction, Vertues and Uſes of it. 61. 2008.

INDEX.

Joh. Sig. *Elſholtii* Clyſmatica nova, ſive Ratio in Venam ſectam medicamenta infundendi. 58. 1200.

Hon. *Fabri* Synopſis Geometrica cum tribus opuſculis. 66. 2055. *His* Dialogui Phyſici, de Lumine; vi Percuſſionis; Liquoris Elevatione per Canaliculum, & Variis Selectis 67. 2057. *His* Phyſica, in 10. Tractus diſtributa. 68.

Joh. Lud. *Ganſii* Coralliorum Hiſtoria 58. 1202.

Ægid. Fr. de *Gottignies* Elementa Geometriæ planæ. 66. 2054.

Hermanni *Grube* de modo ſimpliciorum medicamentorum facultates cognoſcendi. 60. 1085

Joh. Bapt. du *Hamel* de Corporum Affectionibus, tum manifeſtis, tum occultis, lib. duo; ſive promotæ per Experimenta Philoſophiæ Specimen. 65. 2105.

Joh. Dan. *Majoris* de Lacte Lunæ, Diſſertatio Medica. 60. 1086.

Alex. *Marchetti* Exercitationes Mechanicæ. 60. 2008.

Miſcellanea *Medico-Phyſica* Academiæ Germanicæ. 68.

Ant. *Molinetti* Diſſertationes Anatomicæ & Pathologicæ de Senſibus & eorum Organis. 67. 2059.

Local *Motion*; the Laws of it, Engliſhed out of French. 65. 2010.

Joh. *Raii* Catalogus Plant. Angliæ & Inſul. adjac. 63. 2058.

Fran. *Redi* Experienze intorno alla Generatione dell' Inſetti. 57. 1175. Et Sopra alcuni oppoſitioni fatte alla ſua diſſertatione intorno alle vipere. 66. 2436.

Mic. *Seneſcallus* è Soc. Jeſ. de anno, menſe, & die Chriſti nati, baptiſati, & mortui. 60. 1085.

Rob. *Sheringham* Cantab. de Anglorum Gentis Origine Diſceptatio. 62. 2032.

Joh. *Swammerdami* Hiſtoriæ Generalis Inſectorum pars prima. 64. 2078.

William *Sympſon* M. D. his vindication of Hydrologia Chymica. 62. 2032.

Mr. *Teniſons* Examination of Mr. *Hobs* Creed. 64. 2080.

Fran. *Travagini*, Gyri diurni indicium, à Terræ motibus, ac potiſſimum Raguſianis ſuggeſtum. 60. 1084.

Joh. *Walliſii* Mechanica de Motu, Centro gravitatis, & ejus calculo, pars 2*a* 61. 2005.

Joh. *Webſter* Metallographia. 66. 2030.

Fr. *Wilhelmi* Elementa Phyſica, ſive Nova Philoſophiæ principia. 65. 2007.

Tho. *Willis* Affectionum quæ dicuntur Hyſtericæ & Hypochondriacæ, Pathologia Spaſmodica, Vindicata à Reſp. Drs. Highmori; & de Sanguinis Accenſione, & de Motu Muſculari. 57. 1178.

Joh. *Zwelferi* Pharmaco-pœia Regia [illegible] variis additamentis. 57. 1176.

C.

Cold. The Progreſs of Artificial Conglaciation, accurately obſerv'd. 66. 2020.

D.

The Art of teaching *Deaf* and *Dumb* perſons to ſpeak, write, and underſtand a language, performed by Dr. *Wallis* 61. 1087.

E.

Electricity conſider'd. 67. 2059.

F.

A Strange *Fiſh* ſent from New England, deſcribed, and with a Cut, Piſcis Echinoſtellaris Viſciformis. 57. 1153. or ſtella Arboreſcens Rondeletii 58. 1206.

I.

An *Inſect* yielding an Acid Juyce, and thereby changing blew Flowers into red. The Spirit of this Inſect, powred on Lead, maketh a good Saccharum Saturni, &c. 68. p. 2064, 2065.

L.

Concerning a way of Prolongation of Humane *Life*. 58. 1179.

Light, whether a Body. 67. 2058.

M.

The *Magnetical* Declination found at Rome Anno 1670. 58. 1184. Mines make no Impreſſion at all on the Needle, ibid. The Difficulty of finding the cauſe of the variation repreſented, with directions, and a requeſt from the R. S. that Meridians be made and examined accurately in ſeveral places. 58. 1185 &c. Obſervations of the late Variations of the Needle at Dantzick by M. *Hevelius*. 64. 2059. Perhaps by ſome changes in the Rotation of the Earth reſembl'd to the Libration of the Moon. Ibid.

Mercurial Experiment conſidered. 67. 2059.

Meteors: Halo's, Parelia's or Mockſuns, and their cauſes, demonſtrated in Schemes. 60. 1065. Very ſtrange effects of a Thunderbolt at Stralſund in Pomerania, June 19. 1670. 65. 2084.

Mines and Minerals in Hungary, Tranſilvania, *Auſtria*, and other Neighbouring Countries, &c. By Dr. *Edward Brown*. 58. 1189. and 59. 1042. *An Accompt* of the Sal-Gem-Mines in *Poland*, 200 fathoms deep. 61. 1099. *A* Rock of Natural Salt lately diſcover'd in *Cheſhire*. 66. 2015.

Money. The Indians white Wampompeage, the Matrices in which thoſe ſhels are bread, ſent from New England. 57. 1152.

The *Monſtrous* Birth of a double Child at Plymouth, and the Anatomy of it by Dr *Durſton*. 65. 2096. *A* Congealed liquor found in the Pericardium or about the heart. 58. 1184. *See Anatomie.*

INDEX.

Motion: Many things diſcuſs'd about it by *Hon. Fabri*; who particularly examines the Rules of Motion deliver'd by *M. Hugens*; who alſo denieth, that a Body Horizontally projected comes at the ſame time to the ground with another fallen down perpendicularly: and who conſiders likewiſe the Principle of the Motion of Reſtitution.

P.

Bigge Oyſters and Cockle ſhels *Petrified* on the Rocks in the remote parts of France. 5. 183.

R

An Unuſual *Refraction* diſcover'd by *Eraſm. Bartholin* in a Chryſtal-like Body to be found in *Iſland*; where occur many conſiderable Obſervations, Experim. and Reflexions. 67. 2039.

Reſpiration examined by *M. Boyle* in Machina Boyliana N. 62. and N. 63. How long Ducks laſt in Machina. 62. 2011. The *Phœnomena* afforded by Vipers, Frogs, and Kittlings. p. 2013, &c. Tryals about Air harboured in the pores of water. 2019. Shell fiſhes and Scale fiſhes. 2023. *A* Bird and Frog, both wounded in the *Abdomen*, tryed 2026. The Motion of the ſeparated heart of a Cold *Animal*, tryed. 2027. The compariſon of the times wherein an *Animal* may be killed by Drowning, or by withdrawing the *Air*, tryed in a Greenfinch, a Sparrow, and a Mouſe. 2028. &c. That water Fowle, (at leaſt Ducks) can live longer under Water than Land-birds. 2029 Tryals of a Viper in Machina, and afterwards under water, and ſome reaſons render'd, why the longer ſurviving in Machina, does not ſufficiently prove, that *S*uffocation does not kill Animals faſter than the deprivation of *Air* 2031.

Tryals made in reference to thoſe Diſeaſes and Diſtempers, which are thought principally to affect the reſpiratory Organs N. 63. p. 2036. By a Linnet, a Lark, a Greenfinch, a Viper. 2037. *A* Digreſſive Experiment concerning reſpiration upon very high Mountains. 2038 Obſervations on an *Animal* in changes of rarity and denſity 2039. *An* unſucceſsful attempt to prevent reſpiration by the production or growth of *Animals* in Machina 2040. *A* Digreſſive *Experiment* concerning the *Expanſion* of Bloud and other *Animal* juices. 2043. Of the power of *Aſſuefaction* to enable *Animals* to hold out in *Air* by Rarefaction made unfit for Reſpiration. 2045

Reaſons why theſe laſt Tryals are to be reiterated for fuller ſatisfaction; and that *Air* unfit for Reſpiration may retain its wonted preſſure. 2046. How neceſſary *Air* is to elevate the ſteams of Bodies. 2048. Tryals made of two ſorts of white Snails, without ſhels, on an Eft, and a Leech. 2049. &c. What hapned to Reptiles, as Caterpillars, in Machina. 20051. Winged Inſects, ordinary Flyes, Fleſh-flyes, with their heads cut off, and otherwiſe Graſhoppers, Shining Beetles, Butterflyes, tryed 2052. &c. Ants, Mites, and ſmalleſt Inſects tryed; and of the neceſſity of Air to the motion of ſuch ſmall Creatures. 2054.

S.

A Rock of Natural *Salt* diſcover'd in Cheſhire, 66. 2015.

The *Salubrity* of an unwholeſome place how to be recovered. 66. 2017.

Seas; their Flux and Reflux conſidered by *Mr. Childrey*. 64. 2061; anſwered by Dr *Wallis* 2068. See Additionals 66. 2038.

A way of making *Sea-water* ſweet. 67. 2048. 2050.

Spiders, The manner how they project their threads. 65. 2013. and 2014. Fit to be added to the like obſervation. N. 50.

Springs, The Palpable Indications of ſome healing Springs, and an Eſſay to detect the cauſes of ſome peculiarities in Springs. 57. 1154. Mineral Springs re examined by Dr. *Witty*. 60. 1074.

Admirable Stone-quarry about Maſtrich. 67. 2051.

V.

Vegetables, Dwarf Oaks having *Acorns* in New *England*. 57 1151. The *Bark* of a Tree growing in Nova Scotia, bearing knobs which contain a Sanative Liquor like Turpentine. 57. 1157. Pods of Silk-Graſs from New *England* deſcribed, and its uſe 57. 1152. *A* Branch of the Cotton-tree from N. *Eng.* Ibid. Obſervations, Directions, and *Enquiries* concerning the motion of *Sap* in Trees. 57. 1155. and 58. 1198. *See* alſo in N. 68. many particulars on this ſubject, in reference to Sycamores and Winter-Bleedings of ſome Trees.

Vinegar, how made in *France*. 61. 2002.

Of *Viſion*: The Principal Organ examin'd by *M. Mariotte*. 59. 1023.

W.

A practice to make a good Muſkadell *Wine* by the Mark or husk of the Grape 58. 1183.

Wood found good ſtore under ground in *Lancaſhire*. 67. 2050.

ERRATA. P. 2069. *l.* 29. r. *Liſter* for *Wray*.

LONDON,
Printed for John Martyn, *Printer to the* Royal Society.

PHILOSOPHICAL
Tranſactions.

GIVING SOME

ACCOMPT

OF THE

Preſent Undertakings, Studies, and Labours

OF THE

INGENIOUS

IN MANY

CONSIDERABLE PARTS

OF THE

WORLD.

VOL. VI.

For the *Year* 1671.

LONDON,
Printed for *John Martyn* at the Bell in St. *Pauls* Church-Yard;
Printer to the *Royal-Society*.

TO THE ILLUSTRIOUS The LORD HENRY HOWARD OF *NORFOLK*, &c.

MY LORD,

I *Have good aſſurance, that I ſhall not have need to ſay much in Juſtification of this Adventure; or to deviſe Reaſons, why I hold my ſelf obliged to addreſs this* Volume *to your Lordſhip. I may, I think, preſume on the* one hand, *that notice will be ſoon taken, that we have here aſſerted and vindicated our care for the* Reſuſcitation *of* Inſtructive Antiquities; *for the* Promotion *of* Arts *and* Sciences; *for the diligent* Perluſtration *of the* Chief parts *of the* World; *together with ſome not un-accurate Reſearches for good Models of* Artifice, *and for many Excellencies of* Nature; (*as will appear in the* Preface, *and in ſeveral of the* Tracts *following thereupon.*) *And ſure I am that on the* other hand *it will be conſider'd, that Your Lordſhip as well by your* Hereditary *Claim, as by your* Perſonal *Inclination and Addiction is pleaſed to be very affectionatly concern'd in all theſe Reſpects; that due Veneration may be given to the* Antient *and Firſt Inventors; and that* Modern *Induſtry be not diſcouraged, but that all advantages be imported from the remoteſt Diſtances of* Time *and* Place, *for the benefit of our own Country, and for Poſterity. Now from theſe Conſiderations I think I may have good hopes, that this my humble Oblation will not be accuſed of any Incongruity, though it be too mean to teſtifie the devotion I bear and owe to your Lordſhip.*

My Lord, *we are bound, on all occaſions to commemorate the Honour, you have done the* Royal Society, *by entertaining them in* Arundel-houſe, *as in a* Princely Colledge, *ever ſince they remov'd from* Greſham; *and for endowing them with a rich and un common* Library; *and for your manifold and great merit in the Advancement of* Learning: *A part of which is recorded in the* Archives *of* Oxford.

Your Incomparable Grandfather, the Renowned Earl Marſhall *of* England, *and* Earl *of* Arundel *and* Surrey, *was in his time acknowledged the* Preſident *and* Fautor *of the Nobleſt Diſciplines, and had the Curioſity and Felicity to collect many of the moſt conſiderable Monuments of the* Primæval Monarchies, *and thereby to enrich this Kingdome with the moſt Antient* Sculptures, *and the moſt Excellent* Paintings. *And ſuch of theſe Monuments, as were proper for the* Theater *of that Univerſity, the famous MARMORA ARVNDELIANA, your Bounty hath placed there as in the fitteſt Seat to ſucceed in the poſſeſſion of the* Remains *of* Old Greece *and* Athens.

But becauſe theſe Glories are too reſplendent for the baſhfulneſs of my Proſe, I ſhall reſign to the Elogy of our late Pindar, *who, when the* Oxonian Theater *was firſt ſolemnized, after he had in his* Pindaric *raptures celebrated the Heroical Vertues of your Moſt Illuſtrious Progenitors,* Dukes *of* Norfolk; *amongſt other great Attributes, juſtly appropriated to your Lordſhip, left us this* Memorandum;

-Clarior emicat
HENRICVS, genuinus Hæres,
Sublimis Columen domûs:
Antiquitati pandit lumen obſcuræ
Tenebráſque demit Hiſtoriæ.
Majoribus Poſteriſque partitur
Largus Influxum bifidum, vetatque
Illis Præteritum deeſſe, vel *his* Futurum.

Conquerors, Emperors, and Crown'd Heads, even when they have perform'd things truly great and worthy of renown, have ſometimes paſſed over the Stage as in a Dumb Shew, ſcarcely mention'd in any Authentick Hiſtory: *But the Muſes do never forget to conſecrate their Votaries,* Philoſophers; *and their own Patrons. And* good Letters *and* Arts *are more laſting than* Marbles. *And they, who recover Life to the beſt Literature; who reſtore, and preſerve, and excite Arts, and who give a longer duration to the moſt laſting Monuments; Theſe may Juſtly claim for themſelves the faireſt and moſt durable Monument, in the perſuaſion of,*

My LORD,
Your Lordſhips
Very Humble and Obedient Servant

London,
Febr. 19. 16$\frac{71}{72}$.

Henry Oldenburg Soc. Reg. Secret.

Numb. 69.
Beginning the Seventh Year.

PHILOSOPHICAL TRANSACTIONS.

March 25. 1671.

The CONTENTS.

A Preface to the Seventh *Year of theſe Tracts. A Solution of a Chorographical Probleme, given by Mr.* John Collins. *An Accompt of ſome* Mineral *Obſervations touching the Mines of* Cornwal *and* Devon; *wherein is deſcribed the Art of Trayning a Load; the Art and Manner of* Digging *the Ore; and the Way of* Dreſſing *and of* Blowing *Tin: Communicated by an Inquiſitive Perſon, that was much converſant in thoſe Mines. An Accompt of two Books:* I. *PRODROMO overo Saggio di alcuni Inventioni nuove premeſſe all' ARTE MAESTRA di* P. Franceſco Lana *della Compagnia di Jeſu, in* Breſcia, 1670. *in* 4°. II. Joh. Henr. Meibomii *de CEREVISIIS, Potibuſque & Ebriaminibus extra VINUM aliis, Commentarius; annexo Libello* Turnebi *de* Vino: *Helmſtadii* 1668. *in* 4°.

A PREFACE

To this *Seventh* years of theſe Tranſactions.

F*Or a Preface to the* Seventh *Year of theſe Tracts, which I am now beginning, I ſhall here recite a few lines taken out of the Concluſion of Mr.* Cowleys Propoſition for the Advancement of Experimental Philoſophy; *where he diſtributes to his Colledge of Philoſophers* their Task *in* Four *Branches:* Firſt, *To weigh, examine, and prove all things of Nature,* *deliver'd to Us by former Ages; To detect, explode, and ſtrike a Cenſure through all falſe Monies, with which the World hath been paid and cheated ſo long; And, as I may ſay, to ſet the Mark of the Colledge upon all true Coyns, that they may paſs hereafter without any further tryal.* Secondly, *to recover the loſt Inventions, and, as it were, drown'd Lands of the Ancients.* Thirdly, *To improve all Arts which we now have.* Laſtly, *To diſcover others which we yet have not.* Thus he; *And with great confidence,* That there was never any project thought upon, which deſerves to meet with ſo few Adverſaries as this. For who (*ſaith he*) can without impudent folly oppoſe the Eſtabliſhment of ſuch a Colledge (*ſuch a Society I ſhould ſay*) who make it their buſineſs to ſtudy the Improvement and Advantage of all other Profeſſions, from that of the higheſt General, even to the loweſt Artiſan? Who imploy their time, wit, learning and induſtry to theſe *four* ends, the moſt uſeful that can be imagined.

But in this Expectation Mr. Cowley *was much diſappointed, and deceived. There are ſome, who ſeek all occaſions to diſcourage our Induſtry; to affront and diſparage Experimental Philoſophy and thoſe that contribute their Aydes in it: Sometimes, to render it odious for Novelty, they call it contemptuouſly the* New Philoſophy; *when as yet perhaps themſelves are not ignorant, that 'tis ſo old as to have been the* Diſcipline in Paradiſe; *and from the Firſt of Mankind (who from obſerving the kinds and differences of Animals gave them Names) to have been practiſed and countenanced by the Beſt of Men; Patriarchs and Prophets; oft-times with Divine Aſſiſtances and Inſpirations; giving them, that were ſuccesful therein, very eminent attributes of Glory, as in* Noah, Moſes, Solomon, Daniel *and others.*

But let us try theſe Cenſures in Particulars. Is it New Philoſophy, *to inquire diligenty* the things that are; *I mean, To know how the World was made, and the Operation of the Elements; the beginning, ending, and midſt of Times; The Alterations of the Turning of the Sun, and the Change of Seaſons; The Circuit of Years, and the Poſition of Stars; The natures of Living Creatures, the Furies of Wild Beaſts, and the Reaſonings*

ings of Men; the Violence of Winds, and the Motions of the Seas; the diverſities of Plants, and the virtues of Roots; And all ſuch things, as are either Secret or more Manifeſt? For this New Philoſophy *we were diſciplined by the laudable Examples of the moſt Ancient Sages of the* Eaſt. *And we had the ſame or the like Guides (no leſs than the ſame Old Authority) to licence our addiction to the* Mathematicks *and* Mechanicks, *for Military, Civil, or Naval Architecture;* from *the ſoundeſt Foundations of Holy Cities, Temples, Thrones of Wiſdome, Palaces of Glory, and Monumental Pillars,* to *the curious Sculptures and other inſpired Workmanſhip of* Aholiab *and* Bezaleel. *And if Modern diligence hath dived ſo deep, as to find more ſatisfaction in* Atoms, *than in the* three controverted Principles, *will* Diogenes Laertius, *or any other Hiſtorian, or Antiquary, allow theſe Criticks to call the* Atomical *the* New Philoſophy? *Or have our Modern Atomiſts done amiſs in purging the Old Atoms of* Greece *from the Heatheniſh Errors of* Greece?

The next Shift is, to accuſe us of neglecting and deſpiſing all Antiquities. *Yet perhaps they have ſeen the contrary in the* Preface *to the ſecond* Volume *of our* Tranſactions, *where we ſay;* 'Tis our Main buſineſs, as well to retrive all valuable Antiquities, as to ſupply freſh diſcoveries; to recover good Old helps, as to deviſe New. *And how carefully have we (all along) taken notice of the endeavours of the Curious, to revive Old Arts, and to extricate conſiderable Antiquities? This we have done with great reſpects and ſincere veneration. And for this cauſe, in our former* Volumes *we have celebrated* Lambecius, *for his noble undertaking to commemorate the chief Authors and Improvers of all former Arts and Sciences; And* Salmaſius, *for the care he hath taken to find out the Old Medicable Plants, and for the right he hath done* Pliny, *where he deſerved it: And perhaps ſomewhat more might be done for* Pliny, *if, by our Conqueſts, we could enter as deeply, and civilize the* Inlands *of* Africa *and* Aſia, *as, by our late Navigations and Commerce, we have done upon their* Coaſts: *This we are invited to believe by the late Adventures of Maſter* T. S. *when as a Slave he was only employed in a Military Expediti-*

on about the borders of Argiers, *(if it may be credited;) And by the Relations of others in their caſual Excurſions elſewhere. And certainly* Pliny *was a perſon of great Induſtry and Knowledge; and might ſometimes (and perhaps too often) receive Incredibilities, becauſe he was at other times convinced of many* improbable *and* ſtrange *Truths, which at firſt ſight ſeemed equally incredible. And as much perhaps may be ſaid for* Herodotus, *who was* rightly *inform'd of ſo many* Orientis Mirabilia *(as* Q. Curtius *calls them) that he might be reaſonably tempted to deliver other ſtupendious Relations: And ſome of the ſtrangeſt of theſe may ſeem to be ſomewhat confirm'd or parallel'd in our dayes, by the Remains of the Eaſt in* China, *and by the Prodigies (as I may call them) of* Japan.

The Firſt Man lived a long age, and could not be ſo long idle as not to relate to his Poſterity the Works of God or his Angels, (at leaſt for Gardens, Plantations of Vegetables, Flowry Walks, Proſpects, Lands-capes, Arbors, Rocks, Mountains, Fountains, Channels of Rivers, and rich Materials) which he had ſeen in his loſt Paradiſe. The Authentick Monuments of remoteſt Antiquities do make early mention of Gold, *the* Onyx-ſtone *and* Bdellium, *and the Timber* Gopher, *(which ſome gueſſe to be the beſt* Cypreſſe.*) And theſe were ſome of the long-laſting Materials for the Mechanical Arts of Architecture, Sculpture, and other Ornaments. And theſe Long lived Men had need to know laſting Materials, and ſolid work, if they intended to build for their own ſafety, or to leave Monuments for their Poſterity. And, if compared with their Longevity, it was not long after the Deluge of* Noah, *that* Babylon *and* Ninive *bore good teſtimonies to the early growth of Arts.*

Gen. 2. 11,12. c.6.14.

And hence we wiſh an exact ſcrutiny into Old Authors, to give us an accurate Accompt of the Temple of Belus, *the Gardens of* Semiramis, *the Bridge over* Euphrates, *the Walls and Towers in* Babylon *and* Ninive, *and the Obeliskes and other Wonders of the* Aſſyrian *Monarchy: Of the Perſian* Cyrus *his Palace, and the Groves, Orchards, and ſpacious Amænities of the* Medes *and* Perſians: *Of the* Pharos *of* Alexandria; *the* Mauſolæa; *the* Coloſſus *of* Rhodes; *the Image of* Olympick

Jupiter; *the Temple of* Diana, *and other Monuments of* Greece: *Of the* Roman Theaters *and* Amphi-theaters, *their Auguſt and Pompous Structures, Arches, Aquæ-ducts; their Enchroachments into the Seas, and their Confinements of the Seas into Saline Lakes by artificial Mountains and diſturbed Rocks: All theſe to be repreſented in ſuch a faithful and punctual manner, as our Engliſh* John Greaves *hath done for the* Pyramids *of* Egypt *and for the Meaſure of the Old* Roman Foot, *and for the Weight of their* Denarius, *compar'd with other Old Meaſures, Weights, and Coyns of greateſt note; both from the oldeſt Records, & from the beſt of later Interpreters. And though we have not the like Remains of the other famous Structures; yet much light may be had by Examining the moſt credible Relations, and by viewing the chief of later Atchievements.*

Others indeed have taken great pains, and have done excellently well both for the Illuſtration of the Old Mechanicks, of the Ark, the Tabernacle, the Temple, and all the Holy Utenſils: And no leſs for the Gentil Magnificence; yet I ought to applaud this late *pattern of* Engliſh *diligence in Doctor* Greaves; *by whom the* Pyramidographia, *the* Roman Foot *and* Denarius *are ſo well traced out, that they may rectifie and aſcertain the Meaſures in other Hiſtorians and Antiquaries for the fore-mentioned purpoſes. And perhaps, if our Northern Monarchs had the ſame power and purpoſe; that prompt Obedience which was the* devoir *of the Old Eaſt; and had ſo many free Votaries for Works of Magnificence, or for Publick Good; and Services ſo cheap, and the Youth ſo ſoon initiated, ſo well diſciplin'd, and ſo ſedulouſly obliged to attend the Ingenious Arts, as when the Wealth of* Grandees *did, in good part, conſiſt in the Number of Slaves; then we might yet think it poſſible in theſe Times, or in following Ages, to raiſe ſuch as would emulate a* Scopas, *a* Cteſiphon, *a* Phidias, *an* Archimedes, *a* Vitruvius, *to gratifie a* Salomon, *a* Cyrus, *or an* Auguſtus. *And if we fail, it is not our fault, but theirs, who by their officiouſneſs would obſtruct our encouraging ſedulity.*

But we may not lay aſide the other expedient, which is ſo helpful to explicate the Old Wonders of Art, and Old Hiſtories of Nature; namely, To inquire diligently The Wiſd. 7.

things that are; *What Rarities of Nature, and what Inventions of Men are now extant in any parts of the World. And here the* Engliſh *have not been wanting to collect the preſent Teſtimony of theſe later Times from all parts that are yet diſcover'd.* Purchaſe, *by his large and aſſiduous Correſpondence with our Engliſh Merchants, and by other aſſiſtances, did his part ſtrenuouſly, and very uſefully; and hath rather gained than loſt reputation by the greater growth of Experience. Doctor* Heylin, *digeſted into one Volume what he could gather from ſuch credible Authors, as he did beſt underſtand. Mr.* Blome *lately was at an expenſive negotiation to collect into one the beſt Geographical Extracts that he could obtain. And now we have good Expectations from Maſter* Ogilby; *and his* Japan *will forthwith give us a teſt of his diligence and abilities. We ought alſo here to take notice of the* Late Travels *of Sir* Jacomo Baratti, *an Italian Gentleman, into the remote Countries of the Chriſtian* Abyſſines, *or* Æthiopia Interior, *who* (p. 34. *Engliſh*) *aſſures us of a Large Library there, of above* 10000 *Volumes all in Manuſcripts, ſome of them pretending to the higheſt Antiquities.*

And we are not deſtitute of Linguiſts, who are ſkilled in their Language. I ſay this only, to excite Generous Spirits to embrace the opportunities of ſearching, what Old Arts or ſound knowledge the Eaſt or other remote parts may afford us. I think we want no other Language but that of China, *to enable our Diſquiſitions even as far as the Riſing of the Sun, and wherever we may expect any old and conſiderable Literature. And if theſe our free Lines can do no other good, yet they will remain for Witneſſes, whether we are Deſpiſers of Antiquities; whether we are not as cheerfully ready to give hearty welcome to the revival and improvement of Old Arts, as to the Invention of New. For we are well aſſur'd, that Old Wiſdom is much to be preferr'd before newer notions environ'd with endleſs controverſies; though at the ſame time we uſe the freedom of* trying *all, that we may retain what's true and good.*

Thus far I have preſum'd to propoſe our Task; to ſatisfie Objections; to remove Obſtructions; to recommend worthy Authors, and the obliging Induſtry of their ſagacious Expoſitros;

and to repreſent ſome probable ways for the Illuſtration of Ancient Writings. And here I earneſtly implore the Ayde of all the Learned, and the Noble Patrons of Learning, to bring into publick Light the Treaſures of Libraries, before they be ſacrificed to worms and putrefaction; and to examine Herodotus *and* Pliny, Theophraſtus *and* Dioſcorides, *and all the Old Monuments, both with Candour and equal Integrity; to remark what is manifeſtly falſe, or with great reaſon to be ſuſpected; to confirm what may by Parallels be confirmed; and laſtly to ſee what yet further may be added to* Pancirolus, *& what may be thence diſcarded, and what* Succedanea *may be adopted. And now I come a freſh to offer what I have at hand.*

A Solution,

Given by Mr. *John Collins* of a Chorographical Probleme, propoſed by *Richard Townley* Eſq. who doubtleſs hath ſolved the ſame otherwiſe.

Probleme.

The Diſtances of three Objects in the ſame Plain being given, as *A, B, C*; The Angles made at a fourth Place in the ſame Plain as at *S*, are obſerved: The Diſtances from the Place of Obſervation to the reſpective Objects, are required.

The Probleme hath ſix *Caſes.* See *Tab.* 1.

Caſe 1. IF the Station be taken *without* the Triangle made by the Objects, but in one of the ſides thereof produced, as at *S* in the *firſt* figure: find the Angle *ACB*; then in the Triangle *ACS* all the Angles and the Side *AC* are known, whence *either* or *both* the Diſtances *SA* or *SC* may be found. Fig. 1.

Fig. 2. Caſe 2. If the Station be *in* one of the Sides of the Triangle, as in the *Second* figure at *S*, then having the three ſides *A C*, *C B*, *B A*, given, find the angle *C A B*; then again in the Triangle *S A B* all the Angles, and the ſide *AB* are known, whence may be found either *A S* or *S B*, *Geometrically*, if you make the angle *C A D* equal to the obſerved angle *C S B*, and draw *B S* parallel to *D A*, you determine the Point of Station S.

Fig. 3. Caſe 3. If the three Objects lie in a right Line as *A C B* (Suppoſe it done,) & that a Circle paſſeth through the Station *S*, and the two exteriour Objects *A B*: then is the Angle *A B D* equal to the obſerved angle *A S C* (by 21 of the 3d. book of *Euclid*,) as inſiſting on the ſame Arch *A D*: And the Angle *BAD* in like manner equal to the obſerved Angle *CSB*: By this means the point *D* is determined. Joyn *D C*, and produce the ſame, then a Circle paſſing through the Points *A B D*, interſects *D C*, produced at *S*, the place of Station.

Calculation.

In the Triangle *A B D* all the Angles and the ſide *A B* are known, whence may be found the ſide *A D*.

Then in the Triangle *C A D*, the two Sides *C A* and *A D* are known, and their contained angle *C A D* is known; whence may be found the Angles *C D A* and *A C D*, the complement whereof to a Semicircle is the angle *S C A*: in which Triangle the Angles are now all known and the ſide *A C*: whence may be found either of the Diſtances, *S C* or *S A*.

Fig 4. Caſe 4. If the Station be *without* the Triangle, made by the Objects, the ſum of the Angles obſerved is leſs than four right Angles. The Conſtruction is the ſame as in the laſt Caſe, and the Calculation likewiſe; ſaving that you muſt make one Operation more, having the three Sides *A C*, *C B*, *A B*, thereby find the angle *C A B*, which add to the Angle *E A D* then you have the two ſides, *viz.* *A C*, being one of the Diſtances, and *A D*, (found as in the former Caſe) with their contained

Angle *C A D* given to find the angles *C D A* and *A C D*, the Complement whereof to a Semicircle is the angle *S C A*: Now in the Triangle *S C A*, the Angle at *C* being found, and at *S* obſerved, and given by Suppoſition, the orher ∠*A* is likewiſe known, as being the complement of the two former to a Semicircle, and the ſide *A C* given; hence the diſtances *C S* or *A S* may be found.

Caſe 5. If the place of Station be at ſome Point *within* the Plain of the Triangle, made by the three Objects, the Conſtruction and Calculation is the ſame as in the laſt, ſaving only that inſtead of the obſerved Angle *A S C*, the Angle *A B D* is equal to the Complement thereof to a Semicircle, to wit, it is equal to the Angle *A S D*; both of them inſiſting on the ſame Arch *A D*: And in like manner the Angle *B A D* is equal to the Angle *D S B*, which is the Complement of the obſerved *C S B*; and in this Caſe the ſum of the three Angles obſerved, is equal to four right Angles. Fig. 5.

In theſe three latter *Caſes* no uſe is made of the Angle obſerved between the two Objects, as *A* and *B*, that are made the Baſe-line of the Conſtruction; Yet the ſame is of ready uſe for finding the third diſtance or laſt ſide ſought, as in the fourth Scheme, in the Triangle *S A B*, there is given the diſtance *A B*, its oppoſite Angle equal to the ſum of the two obſerved Angles, and the Angle *S A B* attained, as in the fourth Caſe: Hence the third ſide or laſt diſtance *S B* may be found.

And here it may be noted, that the three Angles *C A S*, *A S B*, *S B C*, are together equal to the Angle *A C B*; for, the two Angles *C S B* and *C B S* are equal to *E C B*, as being the Complement of *S C B* to two right Angles; and the like in the Triangle on the other ſide. *Ergo*, *&c.*

Caſe 6. If the three Objects be *A*, *B*, *C*. and the Station at *S*, as before, it may happen, according to the former Conſtructions, that the Points *C* and *D* may fall cloſe together; and ſo a right Line, joyning them, ſhall be produced with uncertainty; in ſuch caſe the Circle may be conceived Fig. 6.

to paſs through the place of Station at *S*, and any two of the Objects(as in the ſixth *Scheme*)through *B* and *C*,wherein making the Angle *D B C* equal to the obſerved Angle *A S C*, and *B C D* equal to the Complement to 180 degrees of both the obſerved Angles in *D S B*; thereby the point *D* is determined, through which, and the points *C*, *B*, the Circle is to be deſcribed,and joyning *D A*, (produced, when need requireth,) where it interſects the Circle,as at *S*, is the place of Station ſought.

This *Probleme* may be of good Uſe for the due Scituation of Sands or Rocks, that are within ſight of three Places upon Land, whoſe diſtances are well known; or for *Chorographical* Uſes, *&c.* Eſpecially now there is a Method of obſerving Angles nicely accurate by ayde of the *Teleſcope*; and was therefore thought fit to be now publiſht, though it be a competent time ſince it was delivered in in writing.

An Accompt

Of ſome Mineral Obſervations touching the Mines *of* Cornwal *and* Devon; *wherein is deſcribed the Art of* Trayning *a Load; the Art and Manner of* Digging *the Ore; and the Way of* Dreſsing *and of* Blowing Tin: *Communicated by an Inquiſitive perſon, that was much converſant in thoſe Mines.*

FOr the more eaſie apprehending of this Art,it is ſuppoſed; *Firſt*, That there hath been a great Concuſſion of waters in that Separation of the waters from the waters mentioned in the Creation, *Gen.* 1. *v.* 9. 10. when the Dry Land firſt appeared; or in *Noahs* Flood; or at both times, whereby the waters moved and removed the (then) Surface of the earth.

Secondly, That before this Concuſſion, the uppermoſt ſurface of Mineral Veins or Loads did (*in moſt places*) lie even with the (then real, but now imaginary) ſurface of the Earth, which is termed by the Miners, the *Shelf*, *Faſt Countrey* or Ground that was never moved in the Flood (ſay they;) whom and whoſe terms, for avoiding of ſuperfluous words and needleſs circumlocutions, I ſhall in theſe following lines repreſent and uſe. I ſaid, *in moſt places*, becauſe they dip in ſome ; as may be collected from the annexed *Scheme* & what ſhall be ſaid anon in the manner of Digging.

Thirdly, That in this Concuſſion of waters the ſurface of the Earth, together with the uppermoſt of thoſe Mineral veins, were then looſed, and torn off, and by the deſcending of the waters into the valleys, both the earth, or *Grewt*, and thoſe mineral ſtones, or fragments, ſo torn off from their Loads (which are conſtantly termed *Shoad*) were together with and by the force of the waters carried beneath their proper places, and from ſome hills even to the bottoms of the neighbouring valleys; And from thence by Land-floods, many miles down the Rivers; in others more or leſs diſtant in the ſides thereof, ſomwhat according to their declivity, and ſomewhat according to the impetuouſneſs of the waters; which, as I conceive, was not in all places alike.

Now theſe three Generals, on which ſeem to depend the grand reaſons of this Art, being ſuppoſed and premiſed, we thus proceed to *Train*:

1. Where we ſuſpect any Mine to be, we diligently ſearch that Hill and Countrey, its ſcituation, the earth, or grewt, its colour, and nature, and what ſort of ſtones it yields; the reaſon hereof being only this, that we may the better know the grewt, and ſtones, when we meet with them at a diſtance in the neighbouring valley; for mineral ſtones may be found 2, 3, 4, 5 miles diſtant from the Hills or Loads, they belong unto.

2. After any great Land-flood (in which it is ſuppoſed there are ſome new frets made in the ſides of the banks,) we go and diligently obſerve ſuch frets (which uſually after ſuch floods are very clean) to ſee, if happily we can diſcover any metalline ſtones in the ſides or bottoms thereof, together with the Caſt of the Countrey (*i. e.* any earth of a different colour from the reſt of the bank) which is a great help to direct us, which ſide or hill to ſearch into. Neither will it be much amiſs in this place to ſubjoyn the few, but ſure, characters of Mineral ſtones, by which we know the kind of metal, and how much it yields. The firſt way

is, by its ponderouſneſs, which eaſily informs us whether it be metal or no. The ſecond is, its poroſity; for moſt Tin-ſtones are porous, not unlike great bones almoſt throughly calcined; yet Tin ſometimes lies in the firmeſt ſtones. The third is, by water, which we term *Vanning*, and that is performed by pulveriſing the ſtone, or clay, or what elſe may be ſuſpected to contain any mineral body, and placing it on a Vauning ſhovel; the gravel remains in the hinder part, and the metal at the point of the ſhovel, whereby the kind, nature and quantity of the Ore is gueſſed at; and indeed moſt commonly without any great deception, eſpecially if the *Vauner* have any judgement at all.

3. But if no *Shoad* may be found or diſcovered in ſuch frets, then we leave that place, neither truſt we to any Metalline ſtones found in the common River, for the reaſon afore-mentioned, and becauſe they rather breed diſtraction, than guide us to the finding out the Load, eſpecially if they are ſmooth, without protuberances, and aſperities, ſuch as are uſual to ſtones newly broken: for then they plainly ſhew they have been brought a great way, and in their tumblings thither are worn ſo ſmooth, as moſt water-ſtones are. Then we go to the ſides of thoſe Hills moſt ſuſpected to have any Loads in them, where there may be a conveniency of bringing a little ſtream of water (the more the better,) and cut a Leat, Gurt, or Trench, about 2 foot over, and as deep as the Shelf, in which we turn the water to run 2 or 3 dayes; by which time the water, by waſhing away the filth from the ſtones, and the looſer parts of the earth, will eaſily diſcover, what Shoad is there. If we find any, we have a certainty of a Load, or at leaſt a *Squatt* in the upper parts of the Hill. *Squatts* are certain diſtinct places in the earth, not running in veins, differing from *Bonnys* (which word will occur by and by,) in this only that *Squatts* are flat, *Bonnys* are roundiſh.

4. Sometimes *Shoad* may be found upon the open ſurface of the ground, as being thruſt up by Moles in their hillock, or turned up by the plow, or by ſome other accidents.

dent ; for it is ſeldome found on the open ſurface of the ground, unleſs brought thither by an accident ſince the Flood, eſpecially in cultivated places ; ſeeing that the corruption of vegetables and other creatures have in the long tract of time begotten a new ſurface, heighten'd in ſome places above a foot, in others more or leſs. And this I have often obſerved, and is eaſily demonſtrable to the eye in every Tin-work.

5. When all theſe wayes have been attempted for finding *Shoad*, if we find any, it makes us proceed with the greater confidence, having an aſſurance of a *Load* ; but in caſe we find not any, then we muſt go by gueſs. And here is all the difference as yet between finding and not finding *Shoad*. For in the next place we ſink down about the foot or bottom of the Hill an *Eſſay-hatch* (an orifice made for the ſearch of a vein, about 6 foot long and four foot broad) as deep as the *Shelf*. And it is obſervable, they are always to be as deep as the Shelf for this reaſon, that otherways you may come ſhort of the *Shoad* : But if we meet with none before, or when we come to the *Shelf* or *Faſt-Countrey*, there is none to be expected ; yet ſometimes the *Shoad* is waſh'd away clean, when you come within 2 or 3 foot from the *Load*, and then the *Load* is a foot or two farther up in the Hill. If we find any *Shoad* in this firſt *Eſſay-hatch*, our certainty is *either* encreaſed if any Shoad were found before ; *or* begun. Neither doth it add a little to make a right conjecture, how high up the Hill, or far off, the *Load*, *String*, or *Bonny* is, carefully to mark how deep from the ſurface of the Earth our *Shoad* lies : for this is held an infallible Rule, that the nigher the *Shoad* lies to the *Shelf*, the nigher the Load is at hand, & *vice verſâ*.

6. Albeit we finde no *Shoad* in this firſt *Hatch*, having found ſome before by the ways afore-mentioned, or having found none, we are not (as yet) altogether diſcouraged ; but aſcend commonly about 12 fathom, and ſink a 2d *Hatch*, as the former : And in caſe none appear in this, we go then as many fathom on each hand at the ſame height, and ſink there as before, and ſo aſcend proportionably with 3 or

more Hatches (if the ſpace of ground requires) as it were in breſt, till we come to the top of the Hill, and if we find none in any of theſe *Hatches*, then farewell to that Hill.

7. But if we find any *Shoad* in any of theſe Hatches, we keep our aſcending Hatches in a direct line; and as we draw nearer the *Load*, the deeper the *Shoad* is (as afore) from the ſurface, but the nigher the Shelf; as ſuppoſe it be 7 foot deep, and but half from the Shelf, then we preſently conclude, the *Load* to be within a fathom or 2 of us, and ſo we leſſen our firſt proportion accordingly, as of that of 12 fathom to 6, 4, 2, 1; as our conjecture guides us.

8. Sometimes it falls out, that we may over-ſhoot a *Load*, that is, get the upper ſide of it, and ſo we looſe it; for which we have another (counted alſo infallible) Rule, *viz.* that finding *Shoad* lying near the *Shelf* in this *Hatch*, and finding none in the next aſcending, we have over-ſhot our Load. The remedy is eaſie, which is to ſink nigher the Hatch, wherein we laſt found *Shoad.*

9. At other times it may happen, that we find a new *Shoad*, that is, two different Shoads in one Hatch, as ſuppoſe in this Hatch we find our Shoad 8 foot deep, in the next we hope to find it at 10 foot; but at 2 or 4 we meet with a new Shoad, and Grewt, (which we diligently obſerve,) and at 10 we meet with our firſt Shoad: Then, I ſay, we have a certainty of another *Load* above the former, and it may be in Training up to the ſecond, we meet with the Shoad of a third. Neither is this diſſonant to the opinion and practiſe of the ancient Tinners, who affirm, that 7 Loads may lie parallel to each other in the ſame Hill, but yet one only *Maſter-Load*; the other 6. (3 on each ſide) being the leſſer concomitants. So may 5 lye in like manner: 3 are common, as in the *Scheme.*

10. Every Load has (as it were) a peculiar coloured earth, or grewt about it, which is found likewiſe with the Shoad in a greater quantity, the nearer the Shoad lies to the Load, and ſo leſſened by degrees about a $\frac{1}{4}$ of a miles diſtance; farther then which, that peculiar grewt is never found with the *Shoad.*

11. A Valley may ſo lye, as at the feet of 3 ſeveral hills; and then we may find 3 ſeveral *Deads*, *i. e.* Common earth, or that looſe earth which was moved with the *Shoad* in the Concuſſion, but not contiguous to the Load in its firſt poſition, (which is alſo termed by us the *run of the Countrey*,) with as many different Shoads in the midſt of each. And here the knowledge of the *Caſt of the Countrey*, or each hill, in reſpect of its *Grewt*, will be very neceſſary, for the ſurer training of them one after the other, as they lie in order according to the fore-going rules of *Eſſay-Hatches:* for the uppermoſt will direct you, with which hill to begin firſt.

12. It may be, that after we have trained up the Hill, inſtead of a Load we find nought but a *Bonny*, or *Squat*; which likewiſe have their Shoad, whoſe form is about 2 or 3 fathom long and half as broad; few larger, moſt leſs: which communicates with no other Load, or Vein, neither doth it ſend forth any of its own; but is entire of it ſelf, whoſe extremities terminate without running out into little innumerable ſtrings, not lying within walls, as Loads; although they are in the Shelf, (not moved by the Flood) whoſe ſurface is equal every where with that of the imaginary Shelfy one, and may go down five or ſix fathoms deep, ſome more, ſome leſs, and there terminate; which *Squatts* are conſtantly wrought out with good advantage to the Workers when found; neither is the Tin of the baſer ſort.

13. Although the *Virgula divinatoria* of ſome few (whoſe ſucceſs I am ignorant of) hath been employed for finding the orifice of a propoſed Mine, and ſome more curious ways, as that of Waters, which may be thought to iſſue from ſuch Loads (which I will not deny, but may be a very conſiderable way in finding Cole-pits,) Mineral ſteams, Barrenneſs of ſoyl, and the pitching of Nocturnal Lights on the ſuppoſed orifices of Mines; yet becauſe they are rather nice, than needful, and not ſufficient for what they are urged by ſome, unleſs it be to cauſe the over-curious but unskilful Trainer to deſiſt from a farther ſearch after

what by ſuch fallible curioſities may ſeem not to be, but yet by the before-mentioned, and daily experimented rules may eaſily be diſcovered; I ſhall willingly omit to inſiſt on any of them. Now having by this way once found our Load, we preſently conſult,

The Art and manner of Digging *up the Ore.*

1. The difficulty of this is not conſiderable to that of *Training*. When we have found our *Load*, the laſt Eſſay-hatch looſes or rather exchanges its name for that of a *Tin-ſhaft*, or *Tin-Hatch*, which we ſink down about a fathom, and then leave a little long ſquare place, termed a *Shamble*, and ſo continue ſinking from caſt to caſt, (*i. e.* as high as a man can conveniently throw up the Ore with a ſhovel,) till we find either the Load to grow ſmall, or degenerate into ſome ſort of weed, which are diverſe; as *Mundick*, or *Maxy* (corrupted from *Marchaſite*) of 3 ſorts; white, yellow, and green: *Daze*, white, black, and yellow: *Iremould*, black, and ruſty: *Caul*, red: *Gliſter*, bloud-red, and black. [*See theſe hard names explained below.* N°. 3.]

2. Then we begin to drive either *Weſt* or *Eaſt*, as the goodneſs of the Load, or conveniency of the Hill invite; which we term a *Drift*, 3 foot over, and 7 foot high; ſo as a man may ſtand upright, and work; but in caſe the Load be not broad enough of it ſelf, as ſome are ſcarce ½ foot, then we uſually break down the *Deads*, firſt on the North-ſide of the Load (for the greater conveniency of the right Arm in working,) and then we begin to rip the Load it ſelf. [By *Deads* here are meant, that part of the Shelf which contains no metal, but encloſeth the Load as a wall between 2 rocks, and not as that, which was mentioned in the Concuſſion, as in *Training*.]

3. That this myſterious underground-way of working, may the eaſier and ſooner be apprehended, be pleaſed to to caſt an eye on the annexed *Scheme*, in *Tab. II.* as here, by the *Alphabet*, explicated; which may give ſome information

to thoſe that have not been converſant in Mines.

a a. The Eſſay-Hatches.

b b. The wall which the Shelf makes on both ſides the Load, and the Load ſo walled.

c c. The Bonny's or Squatts.

d d. The ſtrings or little Veins of the greater and leſſer Loads.

e e. All Mundick.

f f. Moſt Tin with its Spar, which places prove all good Tin, if the ſtring *d*, *b*, happen to be Tin.

g g. All Clay.

h h. Caul; differing both from *Marcaſite* and *Sparr*: it endureth the fire, which *Marcaſite* or *Mundick* doth not. *Sparr* is a flinty ſtone of different colours.

i i. Clay which may hold a quantity of Tin.

k k. Tin; ſuch flexures are commonly well tinned.

l l. Ire-mould and Daze. *Daze* is a kind of glittering ſtone, enduring the fire, ſome ſofter, ſome harder, of different colours.

m m. Tin again.

n n. All Tin.

o o. Clay carrying Mundick.

p p. A Sell-bed of Tin, which is all Tin, and needs no ſtamping as the other, but dry knacking (*i. e.* without a grate or Cock-water, as anon.) 'Tis obſerved, that a Sell-bed hath never any ſtrings iſſuing from it.

q q. The innumerable ſtrings, like little Capillary veins, in which a Load ſometimes in reſpect of its uppermoſt ſurface may be ſaid to terminate and ſtrike out.

r r. The concomitant Loads on each ſide.

s s. That upper part of the Load, which ſeems as though it were cut off in the ſide of one Hill, and to begin again on the oppoſite ſide of the other Hill; which is when the Load dips almoſt perpendicularly for many fathoms together, and may riſe again in the next Hill (wavie-ways) ſo that the load lies not parallel to the ſurface of the earth every where as hinted before. And hence it comes, that we ſometimes

loſe

loſe our Loads; for otherwiſe it were almoſt impoſſible to loſe them, did they run in a parallel line to the ſurface of the Earth.

11. The Rivers.

4. Albeit I have divided this *Maſter-load* into ſo many parts, and the ſame is to be imagined concerning the concomitants; yet I would not you ſhould ſuppoſe, that ſuch real diviſions happen all at once in one Load, but may happen in diſtant ones.

5. The Inſtruments commonly uſed in Mines, that ſerve for ripping the *Loads*, and breaking the *Deads*, and landing both the Ore and Deads, are; (1.) A *Beele* or *Corniſh Tubber* (*i. e.* double points) of 8 *l.* or 10 *l.* weight, ſharped at both ends, well ſteeled and holed in the middle. It may laſt in a hard Countrey ½ year, but new pointed every fortnight at leaſt. (2.) A *Sledge*, flat-headed from 10 *l.* to 20 *l.* weight; will laſt about 7 years, new-ordered once a quarter. (3.) *Gadds*, or Wedges of 2 *l.* weight, 4 ſquare, well ſteeled at the point; will laſt a week; 2 or 3 dayes, then ſharpened. (4.) *Ladders*. (5.) *Wheel barrows*, to carry the Deads and Ore out of the Drifts or *Adits* to the Shambles.

6. The proportion of Men is, 2 Shovelmen, 3 Beele-men, which are as many, as one Drift can contain, without being an hinderance to each other. The Beele-men rip the Deads and Ore; the Shovel-men carry it off, and land it by caſting it up with ſhovels from one ſhamble to another, unleſs it be where we have a *Winder* with two *Keebles* (great buckets made like a barrel with iron hoops, placed juſt over the then termed *Wind Hatch*,) which as one comes up, the other goes down.

7. A great of this skill conſiſteth in the exact knowledge and obſervation of the Loads dipping; for which we have this general rule: That moſt of our Tin-loads, which run from Weſt to Eaſt, conſtantly dip towards the North, ſometimes they under-lye (that is, ſlope down towards the North) 3 foot in 8 perpendicular; which muſt be obſerved for this reaſon, that we may exactly know,

where to ſink an Air-ſhaft, when occaſion requires; yet in the higher Mountains of *Dartmoor* there are ſome conſiderable Loads, which run *North* and *South:* theſe underly towards the Eaſt.

8. Four or five Loads may run parallel to each other in the ſame Hill, and yet (which is rare) meet all together in one Hatch, as it were in a knot,(which well tins the place;) and ſo ſeparate again,and keep their former diſtances.Such a knot hath been obſerved , and wrought on *Hingſton*, a known Mineral-*Down* or *Common* in *Cornwal* (within two miles of which particular place I have formerly lived ſome years.)

9. The breadth of *Maſter-loads* may generally be from 3 to 7 foot broad, ſeldome larger; unleſs at certain places, as in the *Scheme* at *ff*; or where ſeveral Loads may chance to make a knot, or ſend forth ſtrings or veins; neither retain they their uſual breadth in all parts: for, they may be 6 foot at *gg*, ſcarce 2 at *kk*; nay ſometimes ſcarce ½ inch over; but that is to be underſtood of ſtrings and the narroweſt places of the concomitant ones.

10. The Load is uſually in an hard (*i. e.* in a Rocky or Shelfy) Countrey, made up of metal, ſpars and other weeds, and as it were all a long a continued Rock; but hath many veins and joints, as we ſpeak; but in ſome ſofter Countries, the Tin may lie in a ſofter conſiſtence,as that of clay in a manner petrified, whereby it may rationally be expected, that they make more ſpeed and ſhew in their Drifts, and the before-cited number of Beele-men imploy more Shovel-men.

11. Concerning Water, we have theſe obſervables; that in moſt places we meet with it at ſome feet deep from the Loady ſurface,in other ſome not at many fathom deep. It runs commonly through the heart of the Load, not in a direct continued Channel, but windingly in and out, inſenſibly through the veins and joints of the Load.

12. When we are come at any depth, and find the waters begin to annoy us, as it quickly will if any be in the

work,

work, we deſcend to the bottom of the Hill, where we have that conveniency, and at the loweſt place begin as little a Drift, as the conveniency of working or driving will permit (ſcarce half ſo big as that of the Load) on a level, till we come up to our work. And here becomes the uſe of the *Dial* needful, which we term *Plumming* and *Dialling*, (either to know the exact place of the Tinwork, where to bring our *Adit*; or where to ſink to bring down our *Air-ſhaft* even with the deſired place,perpendicularly; or to know, which way our Load inclines, when any flexures happen;) which is to be perform'd in this manner, *viz.*

13. A skilful perſon with an Aſſiſtant, pen, ink, paper, Sun-dial, and long line, after his gueſs of the place above ground, deſcends into the Adit, or work, and there faſteneth the one end of the line to a fixed thing; and then lets the incited Needle reſt, exactly obſerving, at what point it ſtands, with his pen; then he goes farther in the line ſtill faſtened, and at the next flexure in the Adit makes a mark on his line, by knot, or otherwiſe, and ſets his Dial down again, and there likewiſe notes down that point, on which the Needle ſtands, at the ſecond poſition; and ſo proceeds from turning to turning, ſtill marking down the points, and his line, till he comes to the intended place; which performed, and eactly ſet down, he aſcends, and begins at the orifice of the Adit or work, and repeats what he did in the work; brings his firſt knot, or mark in his line to ſuch a place, as the Needle will ſtand at the ſame point it did under-ground at the knot, and ſo proceeds till he come exactly over the intended place in the Mine.

14. But to reminde what I was ſaying of Water, if this conveniency of an Adit may be had, then our water injures us but a little, as long as we keep on that level with the Adit; for we drive not always on one and the ſame level: As for inſtance; At five fathom we make a drift both wayes, and ſinking five fathom more, we make another

ther drift at ten fathom, and ſo deep as we pleaſe. Now when we once paſs that level, on which our Adit runs, and the water begins to trouble us, we have this remedy; either with a Winder and keebles, or leathern bags, pumps, or buckets to get it up to the Adit-level, and ſo we are enforced to do to the very top, where we have not the convenience of an Adit, as in plains. Some, but very few, works may be dry.

15. We obſerve, that if we have *Water*, we never want *Air* ſufficient for Reſpiration, and our candles to burn in; but yet this caution muſt be annexed, that in a ſoft looſe quagmire, clayie Countrey, by the falling of the Deads after us, yet not in ſuch meaſure, as totally to ſtop us up, albeit we have water (and it may be too much) yet our Air is rather too copious, or ſo much condenſed, as that it becomes in a manner a damp, and requires an Air-ſhaft for vent; which damps are ſometimes enlarged by working of the *Mundick* with the Ore.

16. In caſe the Countrey be not ſtrong enough (as being over-ſoaked with water from above) to ſupport its own weight, we under-prop our Drifts with Stemples, and Wall-plates, placed much like a Carpenters ſquare, on the one ſide, and over head.

This being the moſt uſual way of Digging, and Landing our Ore, we will haſten to give you an Account of

The Manner and Way of Dreſsing *Tinn.*

Although this be the eaſieſt in reſpect of skill and labor, inſomuch that it is commonly the task of the Lads, that are but new beginners; yet I ſhall not ſcruple to ſet it down, together with the deſcription of our Mills, and other neceſſaries, as ſuccinctly and diſtinctly, as I may.

1. After the Ore is landed, and the greater ſtones broken at the top of the Mine by the Shovel-men, 'tis brought on horſes to the ſtamping or knocking mills, and unloaded at the head of the Paſs (*i. e.* 2 or 3 bottom-boards with 2 ſide-boards ſloping-wiſe,) in which the Ore ſlides down into the Coffer: But that it may not tumble down all at once, there is placed an Hatch nigh the lower end of the Paſs (*i. e.* a thwart board to keep up the Ore;) beneath that comes in the Cock-water in a trough cut in a long pole, which with the Ores falls down into the Coffer, (*i. e.* a long ſquare box of the firmeſt timber, 3 foot long and 1½ foot over,) wherein the 3 uſual Lifters, placed between 2 ſtrong broad Lones, having 2 braces or thwart-peices on each ſide to keep them ſteady as a frame, with ſtamper-heads, weigh about 30 *lb.* or 40 *lb.* a piece, of iron; which ſerve to break the Ore in the ſaid Coffer: Theſe Lifters about 8 foot long and ½ a foot ſquare of heart-Oak, having as many In-timbers or Guiders between them, are lifted up in order by double the number of Tappets, (faſtened to as many Arms paſſing diametrically through a great beam, turned by an overſhoot-water-wheel on 2 boulſters,) which exactly, but eaſily, meet with the tongues ſo placed in the Lifters, as that they quickly ſlide from each other, ſuffering the Lifters to fall with great force on the Ore, thereby breaking it into ſmall ſand, which is waſhed out by the Cock-water through a braſſe grate, holed very thick, placed within 2 iron bars at one end of the Coffer into the *Launder*, (*i. e.* a trench cut in the floor, 8 foot long, and 10 foot over,) ſtopt at the other end with a turf, ſo that the waters runs away, and the Ore ſinks to the bottom: which when full is taken up (*i. e.* emptied) with a Shovel.

And here I muſt beg leave to digreſſe a little, that I may inform you, how we make our Mill go ſome 2 hours or more after we give over our attendance on it. We have a *Tiler* (*i. e.* a long pole,) faſtned without at the one end to the ſlew or ponder (*i. e.* that looſe and laſt part of the trough, that conveys the ſtream to the mill-wheel) and at the other end is tyed a ſhort rope with a tranſverſe ſtick at the end of it, curiouſly, but trap-wayes, hitcht at both ends under two little pins faſtened in the Lones for that purpoſe; there's another pin ſet in one of the Lifters, at ſuch an exact height, as that, if there be no Ore in the Coffer to keep that Lifter high enough, the purpoſed pin in deſcending knocks out the water, carrying it quite over the Mill-wheel; ſo that when the Coffer is emptied, the Mill reſts of its own accord. And this is the invention (about 30 years ſince but now become common in thoſe parts) of one *John Tomes*, then a Lad, but now as skilful and experienced a Tinner, as our parts afford; who even then ſaw the Inconveniency of a Bell then uſed, which (as ſome Jacks) would only give notice, that the Coffer was empty; yet before they might come to let out the water, the Mill might break it ſelf in pieces, notwithſtanding their attendance; which by this ingenious knack is now ſaved, and the Mill kept from danger. One Wheel may ſupply three or four Coffers, if we will, but then the Grate-holes of the firſt muſt be much larger than the others, and the reſt proportionable; for Tin may be as well too ſmall (for profitable fuſion) as too great.

2. But to return to our full Launder, it is divided into three parts, *i. e* the Fore-head, the Middle, and the Tails. That Ore which lies in the Fore-head, *i. e.* within 1½ foot of the grate, is the beſt Tin, and is taken up in an heap apart. The Middle and Tails in another, accounted the worſt.

3. The latter heap is thrown out by the Trambling-buddle *i. e.* a long ſquare Tye of Boards, or Slate, about four foot deep, ſix long, and three over; wherein ſtands a man bare-footed with a Trambling-ſhovel in his hand to caſt up the Ore, about an inch thick, on a long ſquare board juſt before him as high as his middle, which is termed the Buddle-head, who dexterouſly with the one edge of his Shovel cuts and divides it long wayes in reſpect of him-

ſelf,about half an inch a ſunder;in which little cuts the water coming gently from the edge of an upper plain board carries away the filth and lighter part of the prepared Ore firſt, and then the Tin immediately after: all falling down into the Buddle, where with his bare foot he ſtrokes and ſmooths it tranſverſly to make the ſurface the plainer, that the water and other heterogeneous matter may without let paſs away the quicker.

4. When this Buddle grows full, we take it up; here diſtinguiſhing again the Fore-head from the Middle and Tails; which are trambled over again: But the Fore-head of this with the Fore-head of the Launder are trambled in a ſecond Buddle (but not different from the firſt) in like manner: The Fore-head of this, being likewiſe ſeparated from the other two parts, is carried to a third, but Drawing,Buddle, whoſe difference from the reſt is only this, that it hath no tye, but only a plain ſloping board, whereon 'tis once more waſhed with the Trambling ſhovel, and ſo it new-names the Ore, *Black Tin*, *i. e.* ſuch as is compleatly ready for the Blowing houſe.

5. We have another more curious way termed *Sizing*, that is, inſtead of a Drawing Buddle, we have an hairen Sieve, through which we ſift, caſting back the remainder in the Sieve into the Tails, and then new-tramble that Ore. After the ſecond trambling we take that Fore-head in the ſecond Buddle, and dilve it (*i.e.* by putting it into a Canvaſs Sieve, which holds water, and in a large Tub of water luſtily ſhake it) ſo that the filth gets over the rim of the Sieve, leaving the Black Tin behind, which is put up into Hogſheads covered, and lockt till the next blowing.

6. The Tails of both Buddles after two or three tramblings are caſt out into the firſt Strake, or Tye, which is a pit purpoſely made to receive them; and what over-ſmall tin elſe may waſh away in trambling. There are commonly three or four of them ſucceſſively, which contain two

ſorts of Tin; the one, which is too ſmall, the other, too great. The latter is new-ground in a Crazemill (in all reſpects like a Greiſt-mill with two ſtones, the upper and the neather,) and after that trambled in order. The former by reaſon of its exceeding ſmalneſs is dreſſed on a *Reck* (provided for that purpoſe, that is, a frame made of boards about three foot and an half broad, and ſix long, which turns upon two iron pegs faſtened in both ends, and the whole placed upon two poſts, ſo that it hangs in an æquilibrium, and may, like a Cradle, be eaſily removed either way) with the ſhovel and water, and made ready fit to be uſed according to

The Manner and Way of Blowing Tinn.

Conceiving it ſufficient to ſay, that our Furnace is no other than an Alman Furnace, I ſhall proceed (only taking notice, that our Lime, though the ſtrongeſt, I ever yet heard of, as being made of the hardeſt Marble, will not endure the fire in our Hearth, but we muſt uſe a particular kind of Clay) to deſcribe a *Tin-kiln*, whoſe ſtructure is four ſquare. At the top is a large Moor-ſtone about 6 foot long, 4 broad; in the middle thereof is an hole made about half a foot diameter. This ſtone ſerves as an head or cover to another like ſtone, placed about a foot beneath it, but is not ſo long by half a foot as the upper, becauſe it muſt not reach the innermoſt or back part of the Wall, which is the open place through which the flame aſcends from a leſſer place below that, where a very ſtrong fire of *furze* is conſtantly made, and another little ſquare hole on the out-ſide, for a purpoſe anon to be mentioned: The fore-part is like a common Oven, and hath ſuch a chimney in the fore-part.

Now when we perceive much Mundick in our Tin, (which ſpoils it by making it britly hard, and not malleable) which we eaſily diſcern before knacking (ſome Loads being much peſtered with it, otherſome not at all;) we are neceſſitated to burn away this Weed in this Kiln after this manner. All the Black Tin (brought to the Blowing-houſe in little Canvaſs-bags on Horſes) that is to be burnt, is laid on the top-ſtone (the Kiln being throughly heated before) and, at the hole above-mentioned, caſt down on the ſecond or bottom-ſtone; at the mouth of which ſtands a man with an iron Cole-rake, to give notice, when enough is let down to cover the ſtone all over about three or four inches thick, which he performs with his rake: The hole at the top is immediatly covered with green turffs, that the flame may reverberate the ſtronger. The Rake-man, after this, conſtantly moves the Tin with his Rake, that all parts of the Mundick may get uppermoſt of the Tin, and ſo be burned away; which we certainly know by this, that then the flame will become yellow (as uſual) and the ſtench leſſened; for whil'ſt the Mundick burns, the flame is exceeding blew. Then with his Rake he thruſts it down, at the open place behind, into the open fire, and then receives a new ſupply of Tin from above, as before. Now when the place beneath, where the fire is made, grows full of Tin, Coals, and Aſhes, with his Rake he draws it forth with the Coals on the mentioned little ſquare hole on the one ſide, near the back, where the Ore (fiery hot and red) lies in the open Air to cool; which will ſcarce be in three dayes, becauſe of the Coals that lye hid in it: But in caſe we cannot ſtay ſo long, then we quench it with water, and is like morter. Albeit we let it cool of it ſelf, or with water, we muſt new tramble it or waſh it (as before) before we put it into the Alman furnace. And becauſe I have ſet down the proportions of Ore and Fire already in the Anſwers to the Mineral Queries, I will not repeat them here, but only add an obſervation or two, and then diſmiſs this ſubject. Moor-Tin (*i. e.* ſuch as is digged up in the Moors) we find runs or melts beſt with Moor-coal, chark't: But our Tin, which lyes in the Countrey, runs beſt with an equal proportion of all Char-coal, and Peate (*i. e.* Moor-coals) for the firſt running; but when we come to remelt our Slags, then we uſe Char-coal. When all is melted down and remelted, there ſometimes remains a different Slag in the bottome of the Float, which we term *Mount-Egge*; And that it is moſtly an iron body, though of a Tin-colour, I accidentally aſſured my ſelf by applying one of the Poles of a Loadſtone to it, which quickly attracted it, yet not ſuch a quantity by far, as that of Iron.

AN
ACCOMPT
OF
TWO BOOKS.

I.

PRODROMO overo Saggio di alcune Inventioni nuove premeſſo all *ARTE MAESTRA* di P. *Franciſco Lana* della Campagnia di [illegible] in *Breſcia*, 1670. in 4°.

THis Introduction is premiſed to a Work , deſigned by the Author to ſhew the Valuableneſs of the Principles and Knowledg of Natural Philoſophy, by ſome of the more conſiderable Inventions and Experiments hitherto found in Authors, and other new ones of this Writer himſelf; who having in his *Preface* with much freedom repreſented and animadverted upon the Errors committed by thoſe, that have and do treat of Natural Philoſophy, and inſiſted much upon the Lord *Bacon* (though not named) his method and way of Philoſophiſing, giveth us in this *Prodromus* an *Eſſay* of ſome (by him eſteemed uſeful) Diſcoveries and Practiſes, for which we are obliged to Philoſophy. Of the many particulars, he reckons up and diſcourſes of in this Fore-runner, we ſhall only recite one, and recommend it to the trial of the Curious; which is a *Way to make any Flowers or Fruits grow without Seed*: and which our Author deſcribeth, as follows.

I took (ſaith he) a quantity of Orange-flowers, and put them into half a pound of Oyl of ſweet Almonds, together with a little Rock-allom, and ſo incloſed all in a glaſs-flask; which being well ſtopp'd, I expos'd to the Sun for a Month, adding ſtill more flowers, when I found the firſt were putrified, yet without taking theſe out. A Month being paſs'd, I powr'd out the Oyl, impregnated with the vertue of thoſe flowers and very odoriferous, into ſeveral Glaſs-Vials, and carefully ſet them aſide, leaving them untouch'd till the next Spring; at which time looking upon theſe Vials, I obſerved within them certain *Flowers* ſwimming in the Oyl, which to me appear'd not at all different from true and freſh Leaves and Flowers of the Orange-Tree. But the wonder encreaſed ſome Months after, when the hot ſeaſon being advanced, the Flowers were turned into *Fruit* about the ſame time that ſuch fruit was ripen'd upon the Tree; there being ſeen at the bottom of the Vials ſome ſmall Oranges with their proper colour, together with thoſe ſmall ſpecks, which that fruit uſeth to have; ſo that they were in nothing diſtinguiſhable from true Oranges, their ſmalneſs excepted.

There are many (*ſo he goes on*) in the Colledge of *Rome* whom I might alledge as Witneſſes of this curious *Metamorphoſis*, but one ſhall ſerve for all, and that is his Excelſency Signior *Innocentio Conti*, now Lieutenant General of the Army of the Church, whoſe high Extraction, rare Valour, and ſublime Wit and Knowledge, have been alwayes admired by me. He was pleas'd to accept of one of theſe Vials from my hands,in which every year hitherto, in the ſeaſon of the Bloſſoming of Oranges, ſuch Flowers are ſeen, which at the time of the ripeneſs of the Fruit are alſo transformed into Fruit.

II.

Joh. Henr. Meibomii de CEREVISIIS, potibúſque & ebriaminibus extra Vinum aliis Commentarius, annexo libello *Turnebi* de *Vino*. Helmeſtadii 1668. in 4°.

THe Publiſher of this *Commentary*, (but lately come to our knowledge) who is the Son of its Author, renders in the Preface a reaſon, why afrer ſo many Books, formerly publiſh'd on the ſame ſubject, by *Gazius*, *Gratarolus*, *Haggecius*, *Schookius*, &c. he would yet publiſh this alſo: In the doing of which he alledgeth, that theſe Authors having only a Medical aim, did meerly examine the nature and quality of thoſe ſorts of Bier, which are *now* in uſe; but that this Writer ſearcheth and relateth from remoteſt Antiquity all kinds of drinks, uſed by all ſorts of Nations, and compareth them with the Modern drinks; diſcourſing of their Uſe only by the by.

This done he diſcourſeth out of Authors, how and by whom, after the firſt uſe of *Water* and *Milk*, were introduced the drinks made out of *Vegetables*; as the Vine, Barley, Wheat, Maiz, Millet, Oats, Rice, Apples, Pears, Pomegranates; and the various Juyces tapped out of Trees, as the Palm, Birch, Sycamore, Maple, and many more. To which he adds thoſe drinks, that are prepared out of *Roots*, *Berries*, *Sugar*, and *Sugar-Canes*, and the like. Then he proceeds to that luſcious drink, which is made out of that Animal ſubſtance *Hony*, called *Meath*, and found mention'd in ſome of the moſt ancient Writers, amongſt whom he citeth *Orpheus*;

Ἔυ τε ἄν δὴ μιν ἴδηαι ὑπὸ δρυσὶν ὑψικόμοισιν
Ἔργοισι μεθύοντα μελισσάων ἐριβόμβων
Δῆσον ——

Poſtquam igitur cernes ipſum ſub quercubus altis
Depoſitum, Succo ex Apibus mox vincula membris
Injice ——

Which relateth to the Fable, in which the *Night* is repreſented to have counſelled *Jupiter*, deſigning to dethrone and caſtrate his father *Saturn*, that he ſhould by making him drunk with *Meath*, caſt him into a deep ſleep, and ſo do with him what he pleaſed.

To theſe he ſubjoyneth many intoxicating Drinks, made with narcotick and other hearbs; as alſo the various ſtupifying Fumes, among which *Tobacco* is now ſo famous and common; to which he applieth what *Virgil* ſings of *Caco*;

Faucibus ingentem fumum, mirabile dictu,
Evomit, involvitque domum caligine cæcâ,
Proſpectum eripiens oculis, glomerâtque ſub auras
Fumiferam noctem, commiſtis igne tenebris.

He concludeth all with the modern various wayes of *Brewing Bier*; of which ſee the *Diſcourſe* it ſelf.

The annexed *Tract* of *Turnebus* is both elegant, and conſiderable for the Obſervations therein alledged, to ſhew the noxious effects of *Wine* in thoſe people, that drink much of that liquor; preferring good Water, Milk, Bier, and eſpecially good Cider, far above it; and taking notice, that Wine-drinkers have generally more deform'd, lower and drier bodies, as alſo ſhaking limbs, and a more haſty decay of ſight, than others.

Errata.

N *Numb.* 68. p. 2081. l. 10. r. *Chylous Urine.* In the Index annexed to *Numb.* 68. add at the very end of the particulars, liſted under the Letter *M*, after the word *Reſtitution*, theſe two numbers, 67. 2058.

In this *Numb.* 69. p. 2090. l. 15. r. *or his Angels.* p. 2092. l. 8. r. *Experience. Doctor.* p. 2095. l. 4. *other at A.*

LONDON,

Printed for *John Martin*, Printer to the
Royal-Society. 1671.

PHILOSOPHICAL TRANSACTIONS.

April, 17. 1671.

The CONTENTS.

Extracts of ſeveral Letters, containing ſundry Inquiries and Experiments about the Bleeding of Trees, eſpecially by the warmth of the Fire; the Circulation of Sap in Trees; the Conſiſtence and Quantity of Sap in the reſpective parts of a Vegetable; and the Communication of one part of a Plant with another, in relation to the Aſcent and Deſcent of Sap, &c. *Some Communications concerning Cyder; and the ſeaſon of Tranſplanting. Obſervations touching Colours, in order to the Increaſe of Dyes, and the Fixation of Colours. An Accompt of ſome Books.* I. Theodori Kerckringii *M. D. ANTHROPOGENIÆ ICHNOGRAPHIA.* II. *PHILOSOPHIA VETERVM, é mente RENATI DESCARTES breviter digeſta ab* Antonio le Grand. II. *TRAITE DE PHYSIQVE par* Jaques Rohault. IV. *Novæ Hypotheſeos de PVLMONVM MOTV & RESPIRATIONIS uſu Specimen.*

Extracts of divers Letters, Written by Martin Liſter *Eſquire, to the Publiſher; Touching ſome Inquiries and Experiments of the* Motion of Sap *in Trees, and relating to the Queſtion of the* Circulation *of the ſame.*

1. *Januar.* 28. 167$\frac{0}{1}$. *York*.

YOu may be pleaſed to put this *Quærie* alſo, concerning the Bleeding of the *Sycamore:* What condition the Soil is of, where ſuch Trees are planted, that ſhall either bleed, or refuſe to do ſo: whether Sandy, as that of *Nottingham*, or a wet Clay, as that of the two Trees, I have obſerved here at *York*. *

2. *Febr.* 8. 167$\frac{0}{1}$. *York*.

Concerning the Bleeding of the *Sycamore*, be pleaſed that I acquaint you with the following Experiment of very late date. The firſt inſtant it froze, the wind at North; the Froſt and Wind continued (ſome little Snow now and then falling) the 2d, 3d, 4th, 5th, 6th, until the 7th in the morning, when the wind came about to the South-Eaſt, and the weather broke up a pace, the *Sycamores* bled not all this while; but the ſeventh about noon, all Trees of that kinde bled very freely both at the Twigs and Body, and I ſtruck above a dozen.

At this ſame Critical ſeaſon, I was willing to repeat the Experiment upon other Trees, and to this end I forthwith ſtruck the *Haw-thorn*, *Hazel*, *Wild-Roſe*, *Gooſeberry-Buſh*, *Apple Tree*, *Cherry-Tree*, *Blather-Nut*, *Apricock*, *Cherry-lawrel*, *Vine*, *Wal-nut*; yet none bled but the laſt nam'd, and that but faintly in compariſon of the *Sycamore*. This is conſonant to our former Experiments: And if it did happen, as I ſaid in one of my former Letters *, that theſe *Sycamores* bled not all this Winter afore at the wounds made the firſt of *November*, I do now think, that if new wounds had been ſtill made at every breach of Froſt, ſome ſignes at leaſt of our *York-ſhire* bleeding *, might have been diſcovered before now: But I affirm no more than I have ſeen and tried.

In all the Monuments of the Ancients, collected by the great induſtry of *Pliny*, I finde but few inſtances of this nature. Amongſt thoſe few there is one, that is regiſtred with two or three remarkable circumſtances to our purpoſe. He tells us, that the *Phyſicians* of old, when they had a mind to draw the juyce of the *Mulberry-tree*, were wont to ſtrike it skin-deep only, and that about two hours after Sun-riſe. This Experiment is twice mention'd by him, and in both places as a ſtrange *Phænomenon*. We might make our Comment upon thoſe places, but for this time are content only to tranſcribe the Texts. *Lib. 16. cap. 38. Mirum, hic (cortex) in Moro, Medicis ſuccum quærentibus, ferè horâ diei ſecundâ, lapide incuſſus manat, altius fractus ſiccus videtur.* Lib. 23. c. 7. *Mora in Ægypto & Cypro ſui generis, ut diximus, largo ſucco abundant, ſummo cortice deſquamato; altiore plagâ ſiccantur, mirabili naturâ.*

---

* Of both which, ſee this *Obſervers* Experiments formerly communicated, *No.* 68. *p.* 2067, 2608.

* See *No* 68. *p.* 2068.

* See the ground for this diſtinction in the ſame *Numb.* 58. *p.* 2067, 2068.

3. *Febr. 15. 167$\frac{0}{1}$. York.*

To continue our Experiments concerning the motion of the Sap in Trees; *Febr.* 11th, all was here cover'd with a white Froſt betwixt 9 and 11 in the morning. The weather changing I made the Experiments, which follow, upon the *Sycamore, Walnut, Maple.* A twig cut aſunder would bleed very freely from that part remaining to the Tree; and, for the part ſeparated, it would be altogether dry and ſhew no ſigns of moiſture, although we held it ſome prety time with the cut end downwards; But, if this ſeparated twig was never ſo little tipp'd with a knife at the other end, it would forthwith ſhew moiſture at both ends. The ſame day, late in the after-noon, the weather very open and warm, a Twig cut off in like manner as in the morning, would ſhew no moiſture at all from any part. Theſe Experiments we repeated very many times with conſtant and like ſucceſs on all the Trees above-mentioned. I enter'd this Experiment with theſe *Quæries* for the next opportunity. 1. Whether a Twig, or the ſmall part of a Root cut aſunder, will not bleed faſter, upon the breaking up of a Froſt, from the part remaining to the Tree, than from the part ſeparated; and whether the part ſeparated will bleed at all, and ſhew no more ſignes of moiſture, than a Twig cut from the top of the Tree, unleſs that ſmall Root be likewiſe cut off at the other end alſo? 2. Whether when it ſhall happen, that a *Sycamore* ſhall be found to bleed upon the ſetting in of a great Froſt, the top twigs and ſmall roots will not both of them bleed freelier from the parts ſeparated, in proportion to their bigneſs? 3. And if it ſhall not ſo prove in the Tryal, that in cold weather the Sap moves *inwards* from Root and Branch to the Trunk, and that upon the breaking of a Froſt, the Sap moves *outward* from the Trunk to the extremities of both Root and Branch; I ſay, if this prove not ſo, whether there be any different motions of Sap at a time in the divers parts of one and the ſame Tree; and where ſuch motions of Sap begin, and whither they tend? 4 Whether the Sap, when it will run, moves longer in the Branches than in the Roots; or whether it begin not to move in all parts of a Tree at a time, and reſt every where at a time? 5. When it reſts, whether it retires to the Body of the Tree, from the Roots and Branches, or ſinks down to the Root, or is any way ſpent by inſenſible ſteams, or is quiet and lodged in every part of the Tree in proportion?

I ſhall long to hear the ſucceſs of your Experiments in the Queſtion of the *Circulation* of the Sap. I have many years been inclin'd to think, that there is ſome ſuch motion in the Juyces of Vegetables. The reaſons which induced me, are; 1. Becauſe I finde, that all the Juyce of a Plant is not extravaſate and looſe, and like Water in a Spunge; but that there are apparent Veſſels in Plants, analagous to Veins in Animals: which thing is moſt conſpicuous and clear in ſuch Plants, whoſe Juyce is either White or Red, or Saffron-colour'd; for inſtance, in each kind of Juyce we propoſe *Lactuca*, *Atractilis*, *Chelidonium majus*. 2. Becauſe that there are very many Plants (and theſe laſt named are of the number) whoſe Juyce ſeems never to be at reſt, but will ſpring at all times freely, as the Blood of Animals, upon Inciſion.

The way of Ligature by Metalline Rings, by you mention'd, is an Expedient I have not uſed; but other Ligatures I have, upon a great number of our Engliſh Plants, not without the diſcovery of many curious *Phænomena*. The ſucceſs of an Experiment of this Nature upon *Cataputia minor Lobel.* was as followes: I tied a ſilk-thread upon one of the Branches of this Plant, as hard as might be, and not break the skin; there follow'd no greater ſwelling, that I could diſcern, on the one ſide of the ſilk than on the other; although in often repeating the Experiment, ſome ſilks were left hours and dayes unlooſed, and yet the dimple which the thread had made in the yielding branches, had a little raiſed the immediate ſides, but both alike: the Plant in like manner would bleed very freely both above and under the Tye. This was alſo, I thought, very remarkable, amongſt other things, in this Experiment, that in drawing the Raſour round about the branch juſt above or below the Tye, the Milky Juyce would ſuddenly ſpring out of infinite ſmall holes, beſides the made orifice, for more than half an inch above and below the Tye: which ſeems to argue, that though there was no Juyce intercepted in appearance from any turgeſcence, (as in the proceſs upon the members of a Sanguineous Animal) yet the Veins were ſo over-thronged and full, that a large orifice was not ſufficient to diſcharge the ſudden *impetus* and preſſure of a ſome-ways ſtreighten'd Juyce.

I have endeavour'd many wayes to diſcover the Configuration of the Veins of Vegetables and their other conſtituent parts and Texture; but enough of this in one Letter.

4. *March* 17. 167$\frac{0}{1}$. *York.*

To the end that I might ſatisfie my ſelf about ſome of the doubts I ſent you, I have been moſt concern'd, according to former thoughts and inclinations, in examining the Truth of theſe Quæries, *viz. Whether Saps are not to be found at all ſeaſons of the Year in a much like Conſiſtence and Quantity in the reſpective parts of a Vegetable; and what Communication one part of a Plant may have with another in relation to the Aſcent and Deſcent of Sap?*

Now, becauſe Sap is then ſaid to Aſcend from the Root, when it is found to move in Tapping; I lopp'd off certain Branches of a *Sycamore*, the morning betimes of a hard Froſt (*Febr.* 21.) before they would bleed, or ſhew any ſigne of moiſture. This I did to vary the *Efficient*, not willing to wait the Change of the Weather, and the *Suns* heat; but brought them within the Air of the *Fire*: And by and by, as I expected, they bled apace, without being ſenſibly the warmer.

The Experiment repeated afforded me divers *Phœnomena*, which follow; and proved *almoſt* an Univerſal way of Bleeding all ſorts of Trees, even thoſe, which of themſelves would not ſhew any ſignes of moiſture.

1. Poles of *Maple*, *Sycamore* and *Walnut*, cut down in open weather, and brought within the warmth of the Fire, did bleed in an inſtant. Alſo *Willow*, *Hazel*, *Cherry*, *Woodbind*, *Blather-nut*, *Vine*, *Elder*, *Barbery*, *Apple-tree*, *Ivy*, &c. *Whicking* and *Egge-berry* Tree (i.e. *Padus Theophraſti*) tried in the ſame manner in *Craven*.

2. *Briar* and *Rasberry-rods* were more obſtinate. *Aſh* utterly refuſed, even heated hot.

3. Branches, that is, Poles with their tops entire and uncut, bleed alſo when brought to the Fire ſide; but ſeem not ſo freely to drink up their Sap again when inverted, as when made Poles.

4. The ſame *Willow-Poles*, left all night in the graſs-ſpot, and return'd the next day to the Fire-ſide, bleed afreſh.

5. *Maple* and *Willow-Poles* bleed and ceaſe at pleaſure again and again, if quickly withdrawn and balanced in the hand, and often inverted to hinder the Falling and Expence of Sap: Yet being often heated, they will at length quite ceaſe, though no Sap was at any time ſenſibly loſt. And when they have given over bleeding, that is, ſhewing any moiſture, by being brought within the warmth of the Fire, the Bark will yet be found very full of Juyce.

6. An hard Ligature made within a quarter of an inch of the end of a *Wood-bind* rod, did not hinder its bleeding at all when brought within the warmth of the Fire.

7. *Maple* and *Willow-Poles*, &c. quite *bared* of *Bark*, and brought to the Fire, will ſhew no moiſture at all in any part.

8. One *Barbery*, or *Pipridge-pole* bared of its Bark, brought to the Fire, did ſhew moiſture from within the more inward Circles, though not any from the outward.

9. *Maple* and *Willow-poles*, &c. *half* bar'd of Bark, woud

bleed by the Fire, from the half onely of thoſe Circles, which lay under the bark.

10. *Maple* and *Willow-poles*, ſplit in two and planed, would not ſhew any moiſture on the planed ſides, but at the ends only.

11. A Pole of *Ivy* did of it ſelf exudate and ſhew a liquid and yellowiſh roſin from the bark and near the pith; but when brought to the Fire-ſide, it bled a dilute, thin and colour-leſs Sap from the intermediat wood Circles.

12. A Pole of *Willow* (for Example) bent into a bow, will ouſe its Sap freely, as in bleeding either ſpontaneouſly or by the Fire.

Extract of a Letter, Written to the Publiſher by Francis Willoughby *Eſq;* *from his Houſe at* Middleton *in* Warwickſhire *March* 16. $167\frac{1}{2}$. *relating to ſome particulars, above-mention'd in M.* Lyſter's *Communications of* Feb. 15. $167\frac{1}{2}$.

SIR, My buſineſs and want of time to proſecute Experiments, I hope will plead my excuſe for not anſwering yours of *Feb.* 18. ſooner. Since that, we have review'd our old notes, and made ſome few Experiments, and finde, that Branches of *Willow*, *Birch*, and *Sycamore*, cut off and held perpendicularly, will bleed *without tipping*; and that the cuting off of their tops does not ſenſibly promote the bleeding. We have not yet made trial in *Maple* and *Walnut*, the weather having been ſuch, that thoſe Trees have not run freely ſince the receipt of your Letter. We doubt not of Mr. *Lyſter*'s diligence and veracity, and wonder, our Experiments ſhould differ*. The Trials we have made this year, confirm thoſe we communicated to you formerly, *viz.* The *Sycamore* bleeds upon the firſt conſiderable Froſt, after the Leaf is fallen, as it did plentifully the 16th of *November* laſt: And both that, *Walnut* and *Maple* bleed all Winter long after froſts, when the weather relents, and the Sun ſhines out; but *Walnut* and *Maple* begin not ſo ſoon as the *Sycamore*. The *Birch* will not bleed till towards the Spring. This year it began ſomething ſooner than ordinary about the beginning of *February*.

---

* See this difference removed below, by Mr. *Liſter* himſelf.

We cut off pretty big branches of *Birch*, and, having tipp'd the ends, inverted them, and faſten'd a *Limbus* or ring of ſoft wax to the *great* ends, which we held upwards; making with the plane of the end a Veſſel of about an inch deep, where-into we powred water, which in a few minutes ſunk into the pores of the wood, and running quite through the length of the branch, dropp'd out of the ends conſiderably faſt, continuing ſo to do as long as we powr'd on water. The like Experiment we made by faſtening ſuch rings of wax to the *leſſer* ends, and powring in water, which run through the wood, and dropp'd out of the greater ends, as faſt or faſter. This we tried once upon a *Sycamore* without ſucceſs.

Extract of a Letter of the above-mentioned Mr. Liſter, *written to the Publiſher from* York, *April* 8. 1671. *both in relation to the further Diſcovery of the Motion of Juyces in Vegetables, and removing the difference noted in the next fore-going Letter.*

SIR, Yours of the 4th inſtant came ſafe to my hands. This laſt Month hath been a buſie time with me in my private concerns, ſo that I have but a few things to return to what you have been pleaſed to communicate to me, in relation to the further diſcovery of the Motion of Juyces in Vegetables. And I muſt acquaint you, that theſe Notes following are above 14 dayes old; for I have ſcarce buſied my head, or put my hand to any Experiment of later date.

One or both ends of the pith of a *Willow-pole* ſeal'd up with hard wax, will yet freely bleed by the warmth of the Fire. This was tried, when the laſt Experiments, I ſent you, were; and were then, I think, omitted.

March 23th. was the greateſt Froſt and Snow we have had this Winter in theſe parts about *York*. Some Twigs and Branches of the very ſame *Willow-tree*, as formerly, and likewiſe of many other Willow-trees, taken off this morning, *March* 23th, when brought within the Air of the Fire, would ſhew no moiſture at all; no not when heated warm, and often and long turn'd.

March 24th, the ſame *Willow-branches*, which yeſterday would not bleed, and were thrown upon the Graſs-ſpot all night,

night; did, both they and others, new cut down by the Fire-ſide, freely ſhew moiſture and bleed this morning upon the breaking up of the Froſt.

Aſh-poles and *branches* this day, nor yeſterday, would by the Fire be no more moiſt, than when I formerly tried them.

The ſame morning *March* 23th, a Twig of *Maple*, which had had the top cut off the 7th of *February* laſt paſt, and which then bled, this day being quite taken off from the Tree, and brought within the Air of the Fire, and held with the formerly cut-end downwards, did not run at all at the end, but held on in that poſture, it did run apace at the other new-cut end uppermoſt, ſo as to ſpring and trickle down.

Note, That this doth well agree with my Experiments made the laſt year at *Nottingham*, where I obſerv'd wounds of ſome months ſtanding to bleed apace at the breaking up of every hard Froſt. For *firſt*, in theſe parts there hath been no hard Froſt this year, not comparable to the laſt year. *Again*, thoſe *Nottingham*-trees I wounded in the Trunk, and they ſtood againſt a Brickwall, and the wounds were on the ſide next it; and beſides had Horſe-dung ſtopp'd in all of them for ſome reaſons; which things did undoubtedly defend them much from the Air and Winds, and keep the wounds ſtill green and open: Wheras the tops of theſe *Maple-twiggs*, ſpoken of in the laſt Experiment, were expos'd in an open hedge to the Air and Winds; as alſo the two *Sycamores* here at *York* mention'd in my *former* Letter to have been wounded in *November* laſt, and not to have ſhew'd any ſignes of moiſture, for that very cauſe, that they were not freſh ſtruck at Bleeding times.

Concerning the Bleeding of *Poles* and entire Branches held perpendicular, Mr. *Willoughby* is in the right, and ſome Experiments in my laſt to you of *March* 17th confirm it. Yet it is very true what I obſerv'd, though the Cauſe I did not then well take notice of, when I firſt made the Experiment and ſent you an accompt of it. For, I held the Twigs, which I had cut off, a ſlope, joyning and holding up the cuts together in my left hand, that I might the better obſerve, which part or cut would bleed or not bleed the faſter; and becauſe I found, that the cut of the ſeparated Twig did not in that poſture (holding it upwards, as I ſaid, for the advantage of my eye) bleed at all, when as the Cut of the Branch remaining to the Tree did freely bleed;

I therefore inverted the ſeparated Twig and held it perpendicular with the cut end downward, and found, that that little they were expos'd to the Air in an upright poſture, had ſo very much check'd the motion of the Sap, that I concluded they would not bleed at all; and yet ſtriking off their tops, and making Poles of them, I found ſome of them, if not all, that I chanc'd to try, as I remember, would ſhew moiſture: But I am convinced ſince, that it was rather ſome unheeded accident, as violently bending them, or perhaps the warmth of my hand and ſeaſon, or place, which cauſed this new motion of Sap, than meerly the ſtriking off their Tops.

Some Communications, about an early Swarm of Bees, *as alſo concerning Cyder; Deſcent of Sap; the Seaſon of Tranſplanting Vegetables: Sent to the Publiſher out of* Herefordſhire *by that Intelligent Gentleman,* Richard Reed *Eſq;, in a Letter dated March* 14. 167$\frac{7}{8}$. *at* Lugwardine.

ON Thurſday laſt, the 9th [illegible] Inſtant, there was at the next houſe to mine a *Swarm* of *Bees*. It was a very fair day to entice them; but elſe *we* never have them till the middle of *May*. I had it from the owner, one *Parry*, now in my work, and I enquir'd of him, whether they did not all leave the Hive, as ſometimes they do unſeaſonably, either for want of food, or out of diſtaſte? He told me, no, but there are as many left behind as came forth. But I (who have ſometime ſtudied the Regiment of that little induſtrious wiſe creature) do conceive, that Poverty drew them abroad to ſeek their fortunes; the infinite Wiſdom having imparted ſuch a Providence to that little Commonwealth, as to ſend part of their Company abroad to ſhift, before their whole ſtock of food ſhall be conſumed, to the deſtruction of them all, (*Deus Maximus in Minimis.*)

And now to what I formerly promiſed. I have read that excellent Book of Mr. *Evelyns*; eſpecially his *Pomona*, and have learnt many things out of it, which I before had not obſerv'd; and particularly the new way of Planting therein mention'd out of the papers of my Ancient and worthy Friend Mr. *John Buckland*, whom I do never remember but with very great reſpects: As alſo the New way of making *Pepin-Cyder* by Sir *Paul Neil*, to whom (unknown) I do, and our whole Country ought to return very many thanks. For certainly, the reaſons, rendred by him of the harſhneſs and the cure of it in

Pepin-cider, are very ſound, and may be uſed to the advancement of *all* our Ciders. I had the laſt year two parcels of Pepin-Cider; of the *one* but few bottles, and that was the Droppings of the *Cheeſe* (ſo we call the Apples when ground and preſt) after we had wrung it as far as we could, and that comes away without any mixture at all of the Pulp of the Apple, being that *Flying Lee* mention'd by Sir *Paul*. The *other*, a Veſſel containing two *Hogsheads*; and *that* (following the reaſon of the directions he giveth, but not having Veſſels to draw it off that Flying Lee when ſetled, and to purſue thoſe directions exactly,) I ſtrained thorow a courſe cloth into the Veſſel, and by that means eas'd it of much of that Lee. Both were excellent good, both for Colour and Taſte; but the Bottles beſt, being the moſt delicious and luxuriant Cider, and moſt pleaſing both for colour and taſt, that ever I knew; yet I have had as good *Red-ſtrake* as ever I drank in any place.

I do commend, for the advancing of Cider in richneſs both for Taſt and Colour, a New Cask; provided it be made of Timber very well ſeaſon'd: otherwiſe it may ſpoil it utterly. The Veſſel I mention'd, wherein I had my Pepin-Cider, was ſuch. And I have often tried it, and found that ſort of Cask to improve Cider.

The beſt Cider, I ever had, was *Red ſtrake* grafted upon a *Gennet-moyle-ſtock*. For, as thoſe kinds do beſt agree, and the Trees ſo grafted ſeldom Canker (as do the old Red-ſtrake upon a Crab-ſtock) ſo the Fruit is far more ingenuous and milder, and being ripe, both rich and large and good to eat, and the Cider is more ſmooth, and abates in ſtrength and harſhneſs of that on the Crab, and needs leſs of mellowing before making; the ſtock in degree altering and reclaiming the nature of the Fruit. For, as an Apple doth beſt grafted on a Crab, which gives acrimony and quickneſs to the Fruit; ſo a Crab (and the Red-ſtrake is no other) grafted on an Apple, receiveth thence gentleneſs, and ſoftneſs, and largeneſs, and an excellent alloy to the ſharpneſs, and (as Mr. *Evelin* calls it) the *wickedneſs* of the Fruit. Which (being but a diſcourſe of the Intercourſe between the Saps both of Stock and Graft) puts me in mind to beg from you the judgement of thoſe Gentlemen of the *R. Society*, that bend their thoughts to this way of knowledge concerning the *deſcent* of the Sap in Winter, which is now generally denied : Though I, as yet,cannot aſſent to it; thinking it an Hereſie in Husbandry,obſtinately to deny the deſcent of the Sap. Beſides many other Experiments to prove that deſcent, this I have obſerved, which I never heard any other did : That the Graft hath influence either to corrupt or to heal the Stock ; nay further, to alter and change the very nature and way of the growing of the Root in the earth ; which I cannot ſee how it ſhould do but by ſending down its Sap thither. I have by certain Obſervation found, that Crab-ſtocks grafted with ſome ſorts of Fruit, which the Soil liketh not,they not the Soil,will (not one or two,but all of that ſort) Canker, not only in the Graft,but the Stock alſo : which if you graft again,upon the former Graft , with a fruit liking to the Soil, will all heal, and ſo become Trees. And further, certain it is by my Obſervation, that 20 Pear-ſtocks being wild,grafted young with the ſame ſort of Pear, and 20 with another ; the Roots of each of them of one ſort will grow alike ; and ſo thoſe of the other. Generally thoſe that naturally grow high, as the *Bare-land-Pear*, root deep, and all do ſo : Thoſe whoſe Heads are buſhy and thick, as the Summer *Bon Chreſtien*, their Roots run wide, and are matted below ; and all are ſo. This diverſity of the way of growing of the Root muſt be by grafting , and could not be but by the intercourſe of Sap, which it receiveth from the Graft ; and that cannot be, but by the return of the Sap.

But in this I deſire rather the judgement of others,than give mine own, becauſe it is of a conſtant uſe to me, to be well aſſured herein. For if the Sap returns not, then may I prune or lop my Trees in any time of the year without loſs of Sap,which I take to be their Blood,and that wherein their life conſiſts.

Concerning the *Seaſon* of *Tranſplanting* , which ſome direct to be in *October* : I did think, and uſed to do ſo alſo ; but for theſe later years, I never begin to plant till *Valentine*'s day, though I have a mild and good Winter, as this was. And I approve late Planting before early ; and as yet , however the Spring or Summer often do prove, looſe fewer by miſcarriage. The *Cold* in the Winter kills more than the *Drought* in Summer ; however it proveth (as the laſt of 1669 was the worſt I have known ;) only the Cold does the work , and we impute it to the drought ; becauſe they languiſh until Summer upon the fatal blow they receive by the Cold in Winter ; and then dye. For, either we take our Stocks out of Woods, or out of Nurſeries; in either place they lye warm. If you then in *October* tranſplant them, you expoſe them on a ſudden to an open Air, and adventure them; being weak, to a long and perhaps cold winter; which they cannot bear, no more than our Men un-uſed to a Voyage beyond the Line, can the heat. Add hereunto, that I can relieve them againſt the Drought, by watering and covering the ground, to keep it cool: But there is no fence againſt the Froſt; which many times gets into the Roots, and kills, ſo that they never ſpring; or, if they do, yet pulingly, and dye in the Spring; or, if they ſurvive, as many do, yet come on very ſlowly and pitifully. For, the Bark does cleave to the wood by reaſon of the cold, which dries and clings them together, that like an hide-bound horſe, they will not admit the Sap, which the Root would ſend up; and other Suckers grow out at the earth, and the Tree grows dry, and turns red: All which diſcovers the Obſtruction in the receiving the Sap, which would come from the root; and then we are forc'd to ſcore and looſen the Bark as we can. Now on the other ſide, if the Summer prove moiſt, the danger and fear of late ſetting is over, and they will thrive and come forward a main; if otherwiſe, I ſeldom ſee but they alwayes keep green and freſh, being maintain'd in life and verdure by the Sap they receive in the beginning of the *Spring*, before they be tranſplanted.

This therefore I do (which I ſubmit to better judgments and experience:) In the dead of Winter I prune and cut the Tree I intend to tranſplant, as I would have it be, to the end to loſe nothing of its ſtrength when I tranſplant. Then I ſuffer it to abide untouch'd by the Spade till *Valentine*'s day, and then remove it after it hath taken in ſomewhat of the Spring. This, I think, will cauſe it to take better and grow better. Niceties in Grafting or Planting I will not trouble you with, nor care I for; but this I thought good to offer to the experience of others (having found it far beſt in mine) becauſe it is that which is of daily and general uſe; and if this ſeaſon be found beſt, it will be that which will be of great advantage to this kind of Husbandry.

In Tranſplanting I am very careful to preſerve and ſet the Roots as large as I may; ſuppoſing the larger the Root, the more of ſtrength and Sap it contains, and ſo will advance the more the growth of the Tree; ſince every thing grows in proportion to the Root beneath: But I am doubtful in this, whether I do well or ill, and deſire the judgement of others. For, I have heard from ſome Planters, and afterwards from a Knight who had experience therein, that Roots cut ſhort doe beſt, as ſending forth New roots, which draw ſap and nouriſhment beſt. And we ſee that *Moyles* ſet on ſlips that have no roots, come to a Tree ſooner. And I have oft obſerved, that a *Moyle* Tranſplanted after it hath taken root does not live ſo certainly, or thrive ſo well as a ſlip newly ſet. But I have gone beyond the bounds of a Letter.

This Letter being imparted to an Ingenious Inquirer into ſuch things, he was pleaſed to return ſome of his conſiderations thereupon, which are like to be publiſhed in our next.

Some Obſervations, touching Colours, *in order to the Increaſe of* Dyes, *and the* Fixation *of Colours; generouſly imparted by the Author of the Four above-mention'd Letters, who annexed them to that of* Februar. 15. 1670.

TWo things, I conceive, are chiefly aimed at in the Inquiry of *Colours*, which ſubject you deſire my thoughts of; the *one*, to increaſe the *Materia Tinctoria*, and the *other*, to *fix*, if poſſible, thoſe colors, we either have already, or ſhall hereafter diſcover for uſe. As to the *firſt*, Animals and Vegetables, beſides other Natural Bodies, may abundantly furniſh us. And in both theſe kinds *ſome* Colours are *Apparent*, as the various colours of Flowers, and the juices of fruits, &c. and the *ſanies* of Animals: *others* are Latent, and diſcovered to us by the effects, the ſeveral Family's of Salt and other things may have upon them. Concerning the *Apparent* colors of Vegetables and Animals, and the various effects of different Salts in changing them from one colour to another; we have many Inſtances in M. *Boyle*. And if we might, with the good leave of that Honourable and Learned perſon, range them after our faſhion, we ſhould give you at leaſt a new Proſpect of them, and obſerve to you the conformity and agreement of the effects of Salt on the divers parts of Vegetables: *Viz.* 1. That *Acid* Salts *advance* the colours of Flowers and Berries, that is, according to the Experiments of M. *Boyle*, they make the infuſions of *Balauſtium* or Pomgranat-Flowers, Red roſes, Clove-jilly flowers, Meſerion, Peaſe-bloom, Violets, Cyanus flowers, of a fairer red; alſo the juices of the Berries of *Liguſtrum*, of black Cherry's, Buck-thorn-berries, of a much fairer red: and to the ſame purpoſe Acid Salts make no great alterations upon the white flowers of Jaſmin and Snow-drops. 2. That *Urinous* Salts, and *Alcaly's*, on the contrary, quite alter and change the Colours of the ſame flowers now named, and the juices of the ſaid Berries alſo, from red to green; even Jaſmin and Snow-drops. 3. Again, that in like manner *Urinous* Spirits and *Alcaly's* advance, at leaſt do not quite ſpoyle the colors of the juices of leaves of Vegetables, of their Wood and Root. Thus M. *Boyle* tells us, that *Urinous* Spirits and *Alcaly's* make the yellow infuſions of *Madder-roots* red; of *Brazil-wood*, purpliſh; of *Lignum Nephriticum*, blew; the red infuſion of *Log-wood*, purple; of the Leaves of *Sena*, red. 4. That, on the contrary, *Acid* Salts quite alter and change the ſaid infuſions from red or blew, to yellow.

In the next place we would note to you the effects of Salts upon *Animals* in the production and Change of colours; but the Inſtances are very few or none, that I meet with in any Author; the *Purple-fiſh* being quite out of uſe, and *Cochineil* and *Kermes* are by moſt queſtioned, whether they are Animals or no; but I think, we may confidently believe them both to be *Inſects*, that is, Worms or *Chryſalys*'s of reſpective Fly's *in proxima fœtura*. We find then, and have tried concerning *Cochineil* (which of it ſelf is red,) that upon the affuſion of the Oyl of Vitriol, that is, an *Acid* Salt, it ſtriks the moſt vivid *crimſon* that can be imagined; and with *Urinous* Salts and *Alcaly's*, it will be again changed into an obſcure color 'twixt a violet and a purple. *Pliny* ſomewhere tells us, that the *Gaules* in his time could dye with Vegetables, what the Romans with ſo much danger and pains ſought for in the bottom of the Sea. Indeed, we find many Plants mentioned by the ſame Author, which either are not known to us at this preſent, or neglected.

To what we have briefly obſerved out of Authors, we will ſubjoyne ſome of our own Conſiderations and Tryals And *firſt*, concerning the *Apparent* Colours in Flowers, we think we may inſert; 1. That generally all Red, Blew and White flowers are immediately, upon the affuſion of an *Alcaly*, changed into a Green colour, and then, in proceſs of no long time, turned Yellow. 2. That all the parts of Vegetables, which are green, will in like manner ſtrike a Yellow with an *Alcaly*. 3. That what Flowers are already yellow, are not much changed, if at all, by an *Alcaly* or *Urinous* Spirit. 4. The Blew ſeed-husks of *Glaſtum Sylveſtre* old gathered and dry, diluted with water, ſtain a Blew, which upon the affuſion of Lye ſtriks a Green, which Green or Blew being touched with the Oyl of Vitriol dyes a Purple; all theſe three colours ſtand. 5. On the tops of ~~*Fungus*~~ *tubuloſus*, ſo called by M. *Wray* in his late Catalogue of the Plants of *England*, are certain red knots; theſe, upon the affuſion of Lye, will ſtrike a Purple, and ſtand.

As for the *Latent* Colours in Vegetables and Animals; to be diſcovered to us by the affuſion of Salts; they likewiſe, no doubt, are very many. We will ſet down only a few inſtances in both kinds, which have not been, that we know of, diſcovered or taken notice of by others. *Latent Vegetable* colours, 1. The Milky juice of *Lactuca Sylveſtris coſtâ ſpinoſa*, and *Sonchus aſper & lævis*, upon the affuſion of Lye, will ſtrike a vivid flame-colour or Crimſon, and after ſome time quite degenerate into a dirty yellow. 2. The Milk of *Cataputia minor*, upon the affuſion of Lye, eſpecially if it be drawn with a knife, and hath any time ſtood upon the blade of it, will ſtrike a Purple or Bloud-red colour, and by and by change into an ignoble yellow. *Latent Animal* dyes, 1. The common Hawthorn-Caterpillar will ſtrike a Purple or Carnation with Lye, and ſtand. 2. The heads of Beetles and Piſmires, &c. will with Lye ſtrike the ſame Carnation-colour, and ſtand. 3. The Amber-coloured *Scolopendra* will give with lye a moſt beautiful and pleaſant *Azure* or *Amethyſtine*, and ſtand.

Laſtly, we might conſider the *Fixing* of colours for Uſe; but we are willing to leave this to more experienced perſons, as alſo the Philoſophizing on the particulars we have produced, to better Heads. Some obvious Inferences we may venture to take notice of; 1. That in all the Inſtances above mentioned, whether Vegetable or Animal, there is not one colour *truly* fixed, however there may, I conceive, be ſome uſe made of them, as they are. I ſay, *truly fixed*, that is, proof of Salt and Fire; for, what ſeem to *ſtand* and be *Lye-proof*, are either wholly deſtroyed by a different Salt, or changed into a much different colour; which muſt needs prove a ſtain and blemiſh, when it ſhall happen in the uſe of any of them. 2. That both the apparent and latent colours of Vegetables are *fixable*: An inſtance whereof we may obſerve in the ſeed-husks of *Glaſtum*, and the Uſe Diers make of the leaves after due preparation. 3. It is probable from the ſame inſtance, that we may learn from the colour of ſome part of the Fruit or Seed, what colour the Leaves of any Vegetable and the whole Plant might be made to yield for our uſe. 4. That the *Latent* colours of Vegetables are præexiſtent, and not produced; from the ſame inſtance of *Woad*, and likewiſe from this that the *Milky* juyce of *Lactuca Silveſtris* doth afford it ſelf a *Red* Serum. 5. That the change of colours in Flowers is gradual and conſtant. 6. That the colours of Flowers, which will not ſtand with Lye, ſeem to be wholly deſtroyed by it, and irrecoverable: Thus it happens in the Experiment; that one part of a Violet-leaf, upon the affuſion of Lye, is changed very ſoon into yellow, and will never be revived into a red by an Acid ſalt; but if another part of the ſame leaf be ſtill green, it will be revived. 7. That the Dryneſs ſeems to be a means, if not of *fixing*, yet bringing the Vegetable colour into a condition of not wholly and ſuddainly periſhing by the otherwiſe deſtroying *Alcaly*. 8. That thoſe Plants or Animals that will ſtrike different and yet vivid colours upon the affuſion of different Salts, and ſtand, as the *Cochinel* and *Glaſtum*, are probably of all others to be reckoned as the beſt Materials.

It would have been a much ſafer way, to have put theſe Inferences in the faſhion of *Quæri's*; but beſides that I affirm no more but matter of fact, it is lawful for our encouragement (as my Lord *Bacon* adviſes) to ſet up reſts by the way, and refreſh our ſelves with looking back, though perhaps we have not much advanced. You will be pleaſed to excuſe the little cohærence that I have uſed in theſe notes, and attribute it to the readineſs and affection I have to anſwer ſuch inquiries as you put to me. I never yet did make this ſubject any part of my buſineſs, but the deſire I have to ſearch after and examine the Medicinal qualities of things in Nature, hath by the by preſented me with ſuch *Phænomena*, as I was not willing to leave unnoted, nor to refuſe them you, though in a confuſed way, becauſe you deſire them. To conclude, how immethodical and barren theſe papers may ſeem; yet the conſideration of them hath led me to a way of *Fixing* colours, which I willingly forbear to relate, until I may have an opportunity of ſhewing the Experiment be-

fore

fore the *R. Society*. I have found out a Colour moſt exquiſitely black,& comparable to the beſt ink;even in the uſe of the pen, and which will not change by Fire or Salt. This an *Engliſh* Vegetable yielded me, and for ought I know (for I have not repeated the trial on any thing elſe) the like method will ſucceed to good purpoſe. I am, *&c*.

An Accompt of ſome Books.

I. *Theodori Kerckringii M. D, ANTHROPOGENIÆ ICHNOGRAPHIA, ſive Conformatio Fœtus ab Ovo uſque ad Oſſificationis principia, in ſupplementum Oſteogeniæ Fœtuum.* Amſtelodami, 1671. *in* 4°.

After that this Author had the laſt year publiſhed, together with a *Specilegium Anatomicum*, his *Oſteogenia Fœtuum* (both which were deſcribed *N°.*54.*p.* 1094. *ſeqq.*of theſe Tracts;) in in the latter of which he had given an Accompt of the Formation of the *Bones* of an Humane Body, from the *Second* Month after Conception to the very time of the Infants Birth; he conſidered, that there were two things yet left behind,neceſſary to the perfect knowledge of *Oſſification*;*viz. Firſt*,what might be the Rudiments and Form of an Human Body, before it came to have any Firmneſs of Bones. *Secondly*, How after an Infants being born, the ſoft Bones acquire by little and little both their Hardneſs and Magnitude. Waving for the preſent the latter of theſe two, he undertaketh in theſe ſheets (which are but *three*) to deliver the firſt Elements, as'twere of our Body, *from* and even *before* the time of Conception; affirming.

1. *Non tantùm in nuptis & fœcundis Mulieribus, ſed etiam in Virginibus eſſe non minùs quàm in Gallinis ova ponentibus etiam citra Galli conſuetudinem, ova quædam* * *piſi viridis magnitudine, in quibus humor latet intus, qui, uti aliorum ovorum albumen & vitellus, dum coquitur, indureſcit : Porro, ova illa mulierum, pelliculis extrinſecus circumdari, quæ poſtquam in uterum prolapſa ſunt ova coitu fœcundata, in Amnion & Chorion brevi commutentur; ova autem ipſa, duorum vel trium dierum ſpatio ad ceraſi nigri majoris magnitudinem excreſcere.*

* *Vide* Nic. Stenonis Muſculi Deſcriptionem Anatomicam *editam* A. 1667. *& deſcriptam* N°.32. *Ubi in Narrationum ibi annexarum poſteriori dictus* Dn. Steno *memorat, per digreſſionem,* dari in Fœminis Teſtes ovario analogos. *Ipſe Author noſter obſervat etiam ,* Fallopium *jam tale quid notaſſe.*

2. That he once met with and open'd a *fœtus* of but *three*, or, at moſt *four* dayes old,(How he came to know and do this, almoſt incredible thing,the Book it ſelf relateth;) and found in a little Globul,that Nature had already form'd therein the Rudiments of an humane Body , ſo as that he could plainly diſtinguiſh the Head from the maſs of the Body, and ſee in the Head (though but obſcurely)ſeveral pricked marks for Organs; the Body in the mean time being nothing but an undigeſted lump.

3. That in a *Fœtus*, *fifteen* dayes old , he could diſtinguiſh the Eyes, Noſe, Mouth and Ears, Arms and Feet.

4. That in another, *twenty and one* dayes old , he was able to ſeparate the matter prepared for Fleſh and Skin, from that which was to be hardened into Bones. As alſo, that the Head ſeemed nothing but a membrane diſtended with wind and ſpirits; but its Arms and Hands were figured, and the Fingers and Toes themſelves diſtinct. Beſides, that in that Cartilagineous part, deſigned for the Bones, he could number the Ribs.

4. That in one of the age of a *Month*, he diſcover'd ſome more conſiſtency, and the upper and lower Jaw-bone repreſented by two Bony pricks; beſides the *Claviculæ* form'd, and almoſt all the Ribbs diſtinct, the Shoulder-blade, and Elbowes, Thigh-bones, and both the Leg-bones,call'd *Focilia*; (where, by the by, he intimateth,that a certain Acid ſpirit in the world is the Efficient,as of all Firmneſs & Solidity,ſo of that in Bones.)

5. That *laſtly* in a *Fœtus* of ſix Weeks he found, that it only differ'd in Bigneſs from that of *Two Months*, by him formerly deſcribed in his *Oſteogenia*; but that the main thing, he took notice of in this, was the diſtinction of ſix ſmall Bones in the lower Jaw, which after the production of the *Fœtus* into the world do coaleſce into one.

All this the Author hath repreſented by *Schemes*,and endeavoured to confirm by anſwering what may be objected againſt his Obſervations. Mean time 'tis hoped , that what hath been performed a good while ſince, upon this very curious and nice ſubject in *England* by the Learn'd Dr. *Timothy Clark*, one of his Majeſties chief Phyſitians, will at laſt be made publick to the ampler ſatisfaction of inquiſitive Anatomiſts,and the more intimate knowledge of that moſt admirable contrivance and ſtructure of Man.

II. *PHILOSOPHIA VETERUM, é mente Renati Deſ Caries* *breviter*

breviter digeſta, ab Antonio le Grand. *Londini, apud* J. Martin, *R. Soc. Typographum, ad Inſigne Campanæ in Cœmiterio S. Pauli. An.* 1670. *in* 12°.

This Epitome of the *Carteſian* Philoſophy, digeſted by the Author for the uſe and advantage of thoſe, that have inclinations to initiate themſelves in the doctrine of that Famous Philoſopher, begins this his Book by delivering the main Rules, by him eſteem'd neceſſary to the acquiſition of Truth. Thence he proceeds to thoſe ſimple Notions, of which our Cogitations are compounded, and concludes this part with a ſhort doctrine of the *Syllogiſm.*

Having ſuccinctly diſpatcht this, he paſſeth on to treat of *Phyſiology*, and exploding the *Materia prima*, the *Subſtantial Forms*, the *Real Accidents* (as theſe are vulgarly taught) he maketh it his buſineſs to prove, That there are Bodies extended in Length, Breadth and Depth, to which belong *Figure*, *Motion*, *Scite*, &c. no otherwiſe than as ſome diſtinct *Modes*. After this, he conſiders the *Heavens*, *Earth*, *Water*, *Air* and *Fire*, and of what parts they are conſtituted. Next, he explains the Fabrick of Man; and giveth an account, how he comes to move and have perception. And he cloſeth all with a Demonſtration (as he ſuppoſeth it to be) of the Exiſtence of a God.

But we ſhall ſay no more of this, ſince we find our ſelves obliged to diſcourſe ſomewhat more largely of an ample Treatiſe of this ſame Argument, lately come to our hands from *Paris*; *viz.*

III. *TRAITE DE PHYSIQUE par* Jaques Rohault. *A* Paris, 1671. *in* 4°.

After that the Author hath in this Ingenious Treatiſe aſſigned the Cauſes, why *Natural Philoſophy* hath been ſteril for ſo many Ages, and found them to be theſe, *viz.* the too ſervil addiction to Authority; the reſting in Metaphyſical, abſtract and general ſpeculations; the ſevering of Reaſon and Experience; and the Neglect of the Mathematiques; He divideth it into *Four* principal parts.

In the *Firſt*, he treateth of the *Body Natural*, and its chief Proprieties, Diviſibility, Motion and Reſt; as alſo, of the Elements and the ſenſible Qualities; where he inſiſteth at large upon the Explication of the Nature and Qualities of Viſion, not ſcrupling to affirm, that upon this ſubject alone he hath collected and deliver'd more Truths in eight or nine Chapters, than are contained in many great Volums, which treat of Opticks, Dioptricks and Catoptricks after the manner of the Antients. In this part 'tis chiefly that *Ariſtotle*, but eſpecially his quarrelling and claſhing Commentators and Followers, are taken to task; the Author repreſenting the *Peripatetick* Principles as altogether inſignificant and uſeleſs, for a rational Explication of any effect in Nature, and taking notice, that *Privation* (one of thoſe principles) is not *in* things nor concurs to their compoſition; that *Matter* (another principle) is, according to them, a ſomething I know not what, and *Form* (the third) ſuch another I know not what; as if giving a meer Name to a thing not known, were enough to make it known. Beſides which, he obſerveth, that the ſame Sect hath introduced in Philoſophy ſtore of ſpecious notions, altogether Chymerical, as Nature's *Abhorrency of a Vacuum*, *Attraction*, *Sympathy* and *Antipathy*, &c. invented to give a reaſon in ſhew of what was not at all underſtood. For, *ſaith he*, what doth it teach a man of the Nature of a *Loadſtone*, to ſay, it hath an *Attractive* vertue, or a Sympathy with Iron. And the *Fear of a Vacuity* anſwers a Queſtion no more, than if a man, being asked, How the Wood came to *Paris* out of remote Provinces, ſhould anſwer, It came there by the *Fear of Cold*, that is, anſwer from the *Final* cauſe, when the *Efficient* is demanded. Moreover, he rejecteth the *Ariſtotelian* Elements, as well as the common *Chymical* ones, and endeavours to eſtabliſh the three *Carteſian*; proceeding from the *Firſt Diviſion* and *Motion*, ſuppoſed to have befaln the Uniform Matter produced by the firſt Author of things. He noteth further, that the *Peripaticks* explain not to any purpoſe, wherein the Senſible Qualities do conſiſt, teaching nothing ſatisfactory of Siccity, Humidity, Hardneſs, Fluidity, Heat, Cold, Taſte, Odour, Sound, Light, Colour, *&c*; that they make Veſſels burſt *ex metu Vacui*; and aſſign the cauſe of the roundneſs of Drops to be the Mutual Love, which the parts of the ſame Liquor have for one another, whence a cloſe union, and ſo a roundneſs; that they affirm of Heat and Cold only what they *do* (and that erroneouſly too) and not what they *are*; that they teach nothing of what maketh a Body ſavoury, ſonorous, lucid, colour'd; that they make a great but vain ſhew with their unconceivable *intentional ſpecies*; that they aſſert Viſion to be made in the *Chryſtallin*, &c.

In the *Second* part he treateth of the *Syſtem of the World*, according to the Three celebrated Hypotheſes, of *Ptolomy*, *Copernic*, and *Tycho*, but giveth the preference to the *Copernican*, as the plaineſt and the moſt rational; eſteeming mean while, that, as to the ſcituation of the parts of the Univerſe, *Tycho* agreeth with *Copernic*, except that he maketh the Firmament to have the Earth for its Center; ſo that all the difference between theſe two Opinions as to the Earth, related to the Fluid matter of the World through which it paſſeth, conſiſts only in this, that *Copernic* ſpeaketh of the motion of the Earth, as one would do, that being to tell how he had been in a Coach from *Paris* to *Orleans*, would mark a certain way, and ſay, he had paſſed over it by the motion of a Coach drawn by horſes; wheras *Tycho* would ſpeak as another man, who though he had likewiſe been in a Coach from *Paris* to *Orleans* the ſame way, yet would not acknowledge any motion neither in the Coach nor in the Horſes, but maintain, that the *Way* it ſelf had moved, and the wheels of the Coach had only turn'd about their Axle-trees, and the Horſes done nothing but lifted up their legs, to let the way ſlide away under them. He obſerveth further that the *Copernican* ſyſteme rightly underſtood attributeth no motion at all to the Earth: For, Motion being taken for nothing elſe than for a ſucceſſive application of a Body to the ſeveral parts of the immediately encompaſſing and neighbouring Bodies, 'tis plain, that what is call'd the *Diurnal* motion of the Earth, belongs rather to the Maſs compos'd of the Earth, the Seas, and the Air, than to the Earth in particular, which is to be eſteem'd in a perfect Reſt, foraſmuch as ſhe is carried away by the Torrent of the matter wherein ſhe ſwims; juſt as we ſay, that a Man is at reſt that ſleeps in a ſhip, whil'ſt the ſhip is indeed in motion: And ſo that which is called the *Annual* motion of the Earth, doth not all appertain to her, nor even to the compos'd maſs of Earth, Water and Air, but to the Celeſtial matter, which carrieth this Maſs about the Sun. After this he diſcourſeth of the Nature of the Stars and their influences. Next, he renders an Accompt of *Gravity* and *Levity* (which for want of premiſes, he could not ſpeak of in the firſt part) and maketh Gravity nothing elſe but a leſs Levity. And laſtly, he concludeth this part with the doctrine of the *Flux* and *Reflux of the Sea*, as depending from the Preſſure of the Moon.

In the *Third* part he explains the nature of the *Earth*, and Earthly Bodies, that is, ſuch as are either contain'd in it or are about it, as the Air, Water, Fire, Salts, Oils, Mettals, Minerals, and Meteors. Where, among many other Remarques, he declareth, that though the Tranſmutation of baſer mettals into Silver or Gold be not *abſolutely* impoſſible, yet *morally* 'tis; foraſmuch as men not knowing in particular, which is the Figure and Size of the little particles that enter into the Compoſition of Mettals, nor the ſhape and ſize of the other ingredients, that may be neceſſary to effect this Tranſmutation, nor have yet found the ſecret to unite them together; that therefore it may very well be concluded, that if it be true what is ſaid of ſome Chymiſts having formerly converted Lead into Gold, it hath happen'd by ſo great a chance, as if a handful of ſand being let fall from on high upon a Table, the grains had ſo orderly ranged themſelves, as to make one read diſtinctly a page of *Virgil's Æneids*.

In the *Fourth* he hath endeavour'd to compriſe all what he thinks is hitherto with any certainty known of the *Body Animate*: where, amongſt a great number of other *Phænomena*, he giveth a particular explication of *Fevers*, eſteeming, that all the ſtrange Symptoms thereof may be very well explain'd by only ſuppoſing, that a little portion of our Blood, or of ſome humor mixing with it when it paſſeth to the Heart, comes to be ſtop'd by ſome cauſe or other, in ſome place of our Body, whence it begins not to flow but at the end of a certain time, and when it is ſo corrupted that it ſomewhat reſembleth *Green Wood* in its manner of kindling; that is to ſay; this Wood being caſt into the Fire, ſeems at firſt to have no diſpoſition at all to take fire, but appears rather capable to extinguiſh it; ſo alſo this portion of corrupted humour is at firſt indiſpoſed to be heated and dilated, when it comes to paſs through the Heart; but then as the Green Wood burns at length more fiercely than what is Dry; ſo this humour may at laſt be heated and rarified much more than the Bloud is in its ordinary temper, *&c.*

IV. *Novæ Hypotheſeos de PVLMONVM MOTV & RESPIRATIONIS VSV Specimen.* Londini 1671. *in* 8°.

The *Anonymous* Author of this ſmall Tract being of opinion, that none of thoſe, that have hitherto written of the *Motion* of the *Lungs* and the *Uſe* of *Reſpiration*, have lighted upon the truth; undertaketh to ſhew, that the Lungs do not, as hath been hitherto received, follow the Motion of the *Thorax* and *Diaphragme*, nor are moved and filled, like Bellows, becauſe they are diſtended; alledging that he hath obſerved from the ſhape and Scituation of the *Diaphragme*, and from its Connexion with the other *viſera*, and the Breaſt and *Abdomen*, that the ſaid *Diaphragme* cannot be moved up and down, or the Cheſt, by the *Syſtole* thereof, be dilated and Inſpiration performed; foraſmuch as it is both above and below, by the intervention of divers membrans, ſo connected with other parts, that it can neither riſe nor ſubſide, no not ſo much as be impelled up and down: But that this *Riff* can only be moved forwards *extrorſum* and backwards *introrſum*; forwards in Inſpiration, backwards in Exſpiration. And eſteeming this to be its proper motion, moſt ſuitable to its Fabrick, Scite, and the whole work of Reſpiration; he declareth openly, that the Motion and Inflation of the Lungs depends not upon the Motion of the Thorax and Diaphragme, but that, for *Inſpiration*, the Lungs are dilated by the Elaſtick force of the Air ruſhing in; and that up[illegible] their Dilatation follows the Intumeſcence of the *Diaphragme* as of a Sail, and its protruſion forwards, and thereupon further the propulſion of the *Thorax*: And that for *Expiration*, the Diaphragme is again contracted, and reſtored to its juſt figure and conſiſtence, and the now effete, clogg'd and ſpring-leſs Air driven out: This Author conceiving, that as long as the force of the *inſpired* Air exceeds the Elaſtic power or the reſiſtence of the Air or the halituous ſubſtance *included* in the Cheſt, ſo long laſts *Inſpiration*; but when the force of the *included* Air, by means of the Contraction of the Diaphragme and its preſſure, overcomes the ſtrength of the *inſpired* Air, then begins and ſo long laſts *Expiration*. So that, according to him, *Reſpiration* is nothing elſe, than a Reciprocation of the Air incloſed in the Cheſt, and an Alternate motion of the Lungs and the Diaphragme; whereby the external Air becomes the firſt origin of all the Animal motion.

As to the *Uſes* of Reſpiration, he eſteems, both from a certain Relation to be found in *Fontana*, and from the ſtructure, Motion and Scite of the Diaphragme, that there are other Uſes of it, than the Cooling of the Heart, the Fanning of the Blood, the Diſcharge of ſteams, the Conveyance of a Nitrous aliment, the Comminution and ſubduing of the Blood, and its intimate commixture with the Chyle, and the promotion of the Blood from one ventricle of the heart to the other; for all this, he ſaith, is perform'd by the help of the *Lungs*, (which is but *one* Organ of Reſpiration:) But then he would maintain, that by the other Inſtrument of Reſpiration, the *Diaphragme* and its Preſſion, there are effected ſuch other things, as are no leſs neceſſary to the preſervation of life, than the former; *viz*. The continual Preſſure of the Chyle out of the ſtomach into the inteſtins, and from thence by the Milky veins into the Glanduls of the Meſentery, and ſo further into the Chyliferous Channel; as alſo the Motion of the Blood out of the *Porta* into the Liver, and out of the Liver into the *Cava*; and that of the Gall into the Bladder of Gall, and thence into the common *ductus* and the Guts: perhaps alſo that thence proceeds the firſt Natural Inſtinct or Perception, exciting alſo the Animal motions.

Which being thus propoſed and deduced by him, he endeavours to ſatisfie the objections that may be made againſt this Hypotheſis; for which, and many other particulars, we refer to the Author himſelf.

NOTE,

AT the end of *p*. 2125. the *Reader* is deſired to add, to prevent all miſtakes, what the Author of that Letter ſignified *April* 21. 1671. to the *Publiſher*, ſince that was Printed, *viz*. That in a very ſharp Froſt the Bleeding is ſtop'd till the weather begins to change; but in a moderate Froſt, though it ſtop in the night, yet in the day-time, if the Sun ſhines out, the Trees will bleed, though the Froſt continue. What we ſaid in our Letter, Printed N°. 57. *p*. 1166. *l*. 45. that Cold did not promote but hinder bleeding; we find holds true, if the Cold be without Froſt.

Beſides, *p*. 2126. at the end of Mr. *Willoughby*'s Letter may be added, what he fur[illegible]r imparted in the above ſaid Letter of *Apr*. 21. *viz*. That ſince his laſt, he had made tryal upon *Walnut* and *Sycamore* as to the tranſmitting of Water, and found, that the water runs through both, but nothing ſo faſt as thorough *Birch*.

ERRATA. In Numb. 69. *p*. 2091. *l*. 24. *r*. *and purſe*. In this Numb. 70. *p*. 2128. *l*. 17. *r*. 9th *inſtant*. *p*. 2130. *l*. 3. *r*. *deſcent*.

L O N D O N,
Printed for *John Martyn*, Printer to the *Royal-Society*. 1671.

Numb. 71.

PHILOSOPHICAL TRANSACTIONS.

May, 22. 1671.

The CONTENTS.

Some Conſiderations of Dr. J. Beal, *upon Mr.* Reeds *Letter, printed in Numb. 70. Shewing, in what ſenſe the Sap may be ſaid to deſcend and to circulate in Plants; and the Graft to communicate with the Stock: As alſo what choice of Apples for the delicacy of the Liquor in peculiar Seaſons; and for eaſie and ſpeedy propagation:* Pears *for ſome Lands proper; their choice for manifold Uſes,* &c: *The beſt ſeaſon for Tranſplantation: An Apiary or Diſcipline of* Bees *recommended for publick benefit. An Extract of a Letter, written by Signior* Malpighi, *concerning the Structure of the Lungs of* Froggs, *Tortoiſes,* &c. *and perfecter Animals; as alſo the Texture of the Spleen. A Narrative of ſome Obſervations lately made in the* Upper Egypt. *An Extract of a Letter from* Negropont, *touching the flux of* Euripus. *A Relation of two conſiderable* Hurricans *in* England, *communicated by Mr.* John Templer. *A Narrative of ſome* Petrifications *in Humane Bodies. An Accompt of Four Books.* I. Franciſci De le Boe Sylvii *PRAXIS MEDICÆ IDEA.* II. *Relatione dello Stato preſente dell' EGYPTO, ſcritto dal Signior* Gio. Mich. Vanſlebio. III. Theod. Kerkringii *M. D. Commentarius in CURRUM TRIUMPHALEM ANTIMONII* Baſ. Valentini. IV. *Cogitationes Phyſico-Mechanicæ de Natura VISIONIS. A.* Johan. Ott.

Some Conſiderations upon Mr. Reeds Letter; *printed in N. 70. ſhewing, in what ſenſe the Sap may be ſaid to* deſcend, *and to* circulate *in Plants; and the Graft to communicate with the Stock: As alſo, what choice of Apples for the delicacy of the liquor in peculiar ſeaſons; and for eaſie and ſpeedy propagation:* Pears *for ſome* Lands *proper; their choice for manifold Uſes, eſpecially for pleaſant, or for laſting liquor; and how to be planted, and order'd for the beſt advantage. The beſt Seaſon for* Tranſplantation. *An* Apiary *or diſcipline of Bees, recommended for publick benefit; all by Dr.* John Beal *in a Letter to the Publiſher of* May 13. 1671.

Sir,

I Am glad, you have my honoured Friend, Mr. *Reed's*, Advertiſements; for he is a perſon of ſure veracity and much experience, and diſdains not (for his diverſion and recreation) to practiſe, with his own hands, inoculations and the finer kinds of graftings. And what ever becomes of his expreſſions for the *Deſcent of Sap*, his Inſtances and Experiments annexed are very much obliging. You have publiſhed my apprehenſions as to that point; and no wonder, if the effects, which Mr. *Reed* mentions, do follow from that correſpondence in all parts of the whole Plant, (which is by me acknowledged,) eſpecially, ſince by the leaves, and all the pores in the branches, and body, the Plant draws a kind ſuſtenance from the Sun, Air and Dews, as by the roots from the ſucculent ſoyl. And as the channels (which I may call the Conduits and Strainers) of ſeveral Stocks and Cions's do differ, ſo may ſome change of the liquor be made by ſeveral kinds of Diſtillation; as Spirit of Wine is ſooner rectified in ſome kinds of winding Tin-Inſtruments, than in a plain perpendicular one.

And from the fore-noted difference of Stocks, and the differing grains of the Roots and Timber, as alſo from the differing Leaves (if accurately inſpected, and conſidered,) we may in time perhaps diſcover ſome particular cauſes of the differing Sap, Fruit and Bloſſoms. And it would become the accurateneſs of this Age, in which ſo many are expert in Draughts, and in Chalcography, to annex to the figure of Plants, the texture and particular grains of each root, ſtem, and branch, both for ornament, and to ſuggeſt further inſtructions, whileſt we learn their taſts and other qualities.

'Tis about fifteen Years ſince I publiſhed a hint, how to diſcover by the Colour, Figure, Tenderneſs, and aſperities of the Leaves of young Apple-Plants, and Crabs, firſt appearing in the Spring, which Plant would yield the more delicate, and which the more auſtere fruit, and liquor, to ſeveral kinds and degrees of delicacy and auſterity, fatneſs and inſipidneſs, and vigour or briskneſs. And this I think allows a conſideration for ſome efficacy, or ſign (at leaſt) of change or operation in the *Deſcent of Sap*. But as far as I dare, or did deny the deſcent of Sap, I meant it in the *vulgar* ſenſe of that expreſſion, *viz.* the main quantity of Sap, which aſcends in the Spring, and is gradually hardened into leaves, bloſſoms, fruit, timber, in ſuch manner as the Oſſification in young Animals is deſcribed by Dr. *Kerckringius* in your laſt Tract of Num. 70. 'Tis a large quantity of Sap, which is expended on the fruit and growth of ſome Trees, on Acorns, Wallnuts, Cheſnuts; and this returns not to the root in winter, yet conſiſts well with the Sentiment of the *Circulation* of the Sap, which in ſome ſeaſons may run the round more ſwiftly than in other: neither do I diſcern, that this makes any oppoſition to Worthy Mr. *Reeds* intentions.

I have long ago publiſhed, and do here again confirm what Mr. *Reed* remarks, that a dull and inſipid Apple is made more guſtful by being grafted on the ſtock of the harſheſt Crab, and an auſtere Apple ſomewhat mitigated on a ſtock of gentler fruit. And I willingly embrace this occaſion to offer my vote, that the *Genet-moyles* were as well known, and as well ſpread all over England, as the Red-ſtrake now is. It would be a great eaſe to the vulgar Husbandman, who (without expences, curioſity, care, or trouble of grafting,) may by the knotted branches propagate them in ground that deſerves not to be called fertile, as they do in the Rye-land, and Gorſty ground in *Wales*; and the Cider made of the fruit (which when perfectly ripe hath a peculiar fragrancy,) is ſo delicatly agreeable for tender palats, that I was once guilty of giving it publickly the precedence before any Red-ſtrake; and I had frequently the ſofter ſex on my ſide, till the heat of *July* did too often alter the caſe. And there is a Summer-Apple well known to Mr. *Reed* by the name of *French Cornel*, early ripe, and very richly full of a moſt pleaſing liquor, which I dare extoll for a moſt delicious beverage, before the ordinary time for Cider comes in. I do not know, whether by art it can be preſerved for durance. 'Tis a ſmall tree, all the branches criſped, and curled, full of knots at every turning, and apt to grow by any branch, that is cut off below the knot. It proſpers beſt in a good mould, better than that of the common fields; yet in the dry Rye-land it bears plentifully every ſecond year, and when one of theſe trees fails, the next of the ſame kind may have a full burden; I did not find all of that kind to agree in the year of forbearance.

And becauſe I am fitter and prompter to ſerve for the *benefit* of many, than for any *curioſity*, I crave leave further to advertiſe, that ſome ſoyl which doth hardly bear Apples, does moſt kindly bear Pears; and there is a great variety of Pears to humor every palate, ſome early ripe, ſome long laſting, and for all ſeaſons of the year, ſome to be rolled, baked or dried, or [illegible] to be preſerved, which may as well be had from [illegible] Countries, as from *Worceſterſhire*, *Herefordſhire* and *Salop*; but my chief aim here is for thoſe Pears which yield the richeſt, wholeſomeſt, and moſt winy liquor in great adundance, and at good certainty; of which there are many excellent kinds in the confines between *Worceſter* and *Hereford* from *Powick* to *Bosbury*, where the Bareland-pear (mentioned by Mr. *Reed*) grows in the common arable field; that, and ſome other pears of uncertain names in *Powick* do yield a very ſtrong and long laſting liquor. The Horſe-pears, as there they call them, the white and the red of ſeveral kinds, yield abundance of pleaſant liquor. The *Ailets* great and little, wild and gentle, the *Linten-pear*, *Lullam-pear*, *Squaſh-pear*, have their peculiar excellencies for liquor, and ſome of them for the largeneſs of the Tree; yielding conſtantly ſome hogſheads of liquor yearly. Where the ſoil hath not been tryed, and found kindeſt for *Apples*, 'tis the ſureſt way to plant Pears alternatively, and where the liquor of Pears is weak, or leſs laſting, this may be helped by a gentle mixture of Crabs, or of the harſheſt *Apples* to humour all palats, and for a help to the Stomach, the mixture being made in the time of grinding the fruit together: and thus, when the better ſoil is too ſhallow for *Apples*, but receives Pears kindly at a greater depth, a hedge-row of Crabs, or wild auſtere apples, raiſed on the mounds and ripening in the ſame ſeaſon, will, by well ordering it, afford ſuch a perfect remedy, that judicious paſats may be deceived, and take it for the beſt Cider. I muſt here give notice, that Sir *W. S.* recommends the *Hamlin-apple* of *Devon* for Cider equal to the beſt, if not excelling. Theſe diſquiſitions of the choiceſt fruits for drink, are modern, and in my memory were ſcarcely regarded in any part of *England* that I could hear of. For the beſt ſeaſon to *tranſplant*, Dr. *Lauremberg* a perſon of much experience, and no leſs learned in the beſt old *Authors*, agreeth punctually in all circumſtances, and for the like reaſons, with the fore-noted worthy Gentleman, that Plants, which cannot well bear the hardſhip of the Winter, ſhould be tranſplanted in the Spring; but that ſuch as are able to bear the extremity of a cold winter, ſhould be tranſplanted in *Autumn*. In this only he differs, that he ſaith, *Poma, pira, ceraſa vulgaria, coryli, oxyocanthi, pruna*, &c. *facile frigus ferunt*, & *Autumno tranſplantari optimo ſucceſſu ſolent*: and then for the Spring he refers *juglandes, perſica, abricoca, aliquot ceraſorum genus*. *Lauremb. de Hort. cult.* l.1.c.28. I think, where he wrote and practiſed, is as cold a Country as *England*: but the more we are obliged for theſe latter Experiments, and for the friendly and ſeaſonable caution to decline adventures againſt the rage of winter. On the ſudden I ſee no good reaſon, why we ſhould expoſe any Plants to the hazard of the winters cruelty, ſince tender plants proſper infallibly by a Vernal tranſplantation; yet I muſt tell you, 'tis an old Engliſh and a Welſh Proverb concerning *Apples*, Pears, and the Haw-thorn-quick, Oaks; *Set them at Allhallontide, and* command *them to proſper; ſet after Candlemas, and* intreat *them to grow.* Mr. *Reed's* pleaſant obſervation of the prudence and ſagacity of *Bees*, invites me to ask, why we have ſo few *Apiaries* in *England* according to Mr. *Mewe's* modell, repreſented in *Hartlib's Common-wealth of Bees, Pag.* 48. &c. which gave him the entertainment at any time to view their Mechanical skil, Chymiſtry, Induſtry, Loyalty, and Diſcipline through the glaſs-windows of his Hive, and paid him alſo wax and hony worth twenty nobles yearly at the leaſt. *I* wiſh this Royal and Loyal in-

~~ſect had~~ a juſt and full number of prompt diſciples all over *England*, which would offer no worſe ſacrifice upon our publick *Altars*, then Hony and Wax, the good example of Piety, Devotion, *Arts* and *Induſtry*.

An Extract of a Latin Letter, *written by the learned Signior* Malpighi *to the Publiſher, concerning ſome Anatomical Obſervations, about the Structure of the* Lungs *of* Froggs, Tortoiſes, &c. *and perfecter Animals; as alſo the Texture of the* Spleen, *&c.*

D*Eſideratiſſimus de Reſpiratione Doctiſſimi* Thruſtoni *libellus tandem ad meas devenit manus; ubi propugnatam vidi meam, de Pulmonum ſubſtantia *, ſententiam. Quapropter Te anxie rogo, ut ipſi meo nomine officioſam dicas ſalutem, plurimaſque eidem gratias agas pro ſpontanea & honorifica meorum dictorum tutela.*

* *Vid.* D. Thruſton. *in Diatriba de Reſpirationis Uſu primario*, p. 42. & p. 143. 144.

*Miratus ſum valdè, A*nimadverſionum *Authori in Teſtudinum,* Lacertarum *& Ranarum Sectionibus non occurriſſe Commercium inter Bronchia, & Pulmones, quos* Veſiculas, *à laxitate exterioris Pulmonum membranæ obortas, vocat; cùm ſanè immiſſâ in Tracheam fiſtulâ, & ſimul inſufflato Aere, Pulmones, eidem Tracheæ appenſi, hinc inde circa Cor turgeant; quod & ad libitum animalis frequenter accidit: Hi etiam, dum Aere turgent, ſi filo innodentur ut ſicceſcant, ſecti, patenter oculis Cellulas & Veſiculas, evidenter membraneas, exhibent. Et licèt in* Ranis *brevis ſit Bronchiorum proceſſus, à* Larynge *tamen bini ductus, ſemi-circularibus aliquot annulis conflati, in membraneas veſiculas hiant; atque ita ſuccedit Inſpiratio & Exſpiratio. At in* Teſtudine, Lacertis *& ſimilibus, oblonga Trachea in binos ſubdiviſa ramos, Aerem pulmonaribus Veſiculis ſubminiſtrat. Scio, in* Ranis, *propè os, hinc inde binas interdum turgentes erumpere* veſiculas *(procul tamen à Pulmonibus,) quæ buccæ ſunt Appendices, & Aere interdum, à pulmonibus in oris cavitatem Expiratione propulſo, foras exilire.*

*Circa exaratos Pulmones reticularem Muſculum locari ſcias, cujus carneos plexus, ſinus, & veſiculas ambientes aliàs ruditer delineavi. Hujus mirabilis contextus patet in Ranis, & Lacertis præcipuè; nam multiplices carnei lacerti per longum producuntur, & tranſverſaliter elongatis fibris invicem continuantur; intermediæ verò areæ reticularibus carneis plexibus ulteriùs occupantur, non abſimili ritu ac in Arborum foliis accidit: Retis autem enarrata hæc minora ſpatia rectis poſtremo fibris, quaſi brevibus tendinibus, pervaduntur. Mirabilis hic Muſculus non exteriorem tantùm Pulmonum ambit regionem, ſed interiores quaſcunque veſiculas & ſinus circumdat, ita ut ſuo motu ſingulas pulmonis partes comprimendo, Expirationem Sonumque promoveat. Hæc eadem ſtructura in pulmonibus Perfectorum animalium proportionaliter obſervatur, & in A*gnorum *extremis præcipuè lobulis, Aere turgidis, & adhuc mollibus, patet.*

Hujus occaſione communicandum Tibi duxi, Lienis *fibras, quæ tot ingenia torſere, nequaquam* nerveas (*quod & aliquando ipſe autumavi*) *ſed* carneas *eſſe, ita ut ex carneo exteriori involucro, & productis tranſverſaliter fibris, mirabilis fiat Muſculus, Lienis cellulas comprimens, quo ſanguis per Splenicum ramum propellatur non abſimili ſtructura ac ritu, qualis in grandioribus Cordis auriculis obſervatur: Carnei etenim lacerti, per tranſverſum ducti, ſuarum fibrarum implicatione Rete efformant, membraneas cellulas comprimens, ſuiſque extremis finibus, mirabiliter productis, carneum involucrum conſtituunt.*

Parùm abſimili ſtructurâ Equinos *præcipuè* Teſtes *Natura ditavit; interior quippe ipſorum tunica* Carneas *fibras, ſeu extenſum muſculum in ſui meditullio, unà cum varicoſis vaſis continet, quæ diverſas inclinationes, ut in Liene, habentes, per tranſverſum productæ, & reticulariter implicitæ, Inteſtinulorum congeriem firmant & comprimunt. Pauca hæc & inordinata in mei amoris & obſequii teſtimonium habeas, precor. Vale, Dabam* Bononiæ *die* 20. Februarii 1671.

A Narrative of ſome Obſervations lately made by certain Miſſionaries in the Upper Egypt; *communicated in a Letter written from* Cairo *the ſixth of* Januar. 1670.

BY yours of *April* the 20th laſt I find, that you deſire to hear ſome news concerning my Voyage in the *Upper Egypt*, I am very ready to give you that ſatisfaction, provided you make our friends ſhare in it. I ſhall therefore tell you, that I have ſpent three months time in that voyage, accompanied with my Brothers, the F. *Charles* and *Francis*, alwaies aſcending upon the *Nile* as high as 300 leagues above this City, being two daies journey on this ſide of the Caſcata's of the *Nile*, & where never any French-man hath been within the memory of man. I there admired ſtore of Idol-Temples yet entire, together with very ancient Pallaces filled with Statues and Idols. I counted in one place alone 7 *Obelisks* like thoſe at *Rome*, and about 120 Columns in one Hall, of the bigneſs of five Braſſes; full within and without, from the top to the bottom, with Hieroglyphic Letters, and with Figures of falſe Deities. I found Statues of white marble; and ſome of black of the bigneſs of three perſons, with a ſword on their ſide, and of an hard ſtone; namely, a Man and a Woman, at the leaſt of the height of eight fathoms, though ſeated in chairs; but well proportioned; And two others of black marble repreſenting women, with Globes on their head and extravagant coverings thereon, which were two foot broad from one ſhoulder to the other.

If I had had more time allow'd me to make this Voyage, or had not been obliged to ſtay long time upon the account of our Miſſion, in ſuch places where nothing conſiderable was to be ſeen, I might have made very curious Obſervations. There are places where I could not ſtay to view them but half an hour, which required very well the ſtay of many hours, and we lighted not but in two places, where Antiquities were to be ſeen, one whereof is called *Lozor*, and the other *Candien*, which is a very ancient Caſtle, eſteemed by the Tradition of the Country to have formerly been the Reſidence of a King. Nor indeed is this hard to believe even before one enters into it, conſidering in the advenues of the ſaid Caſtle a great number of *Sphinxes* ſtanding in a row,and turning their head towards the Alley.'Tis known that this is an Idol having the Head of a Woman and the Body of a Lion, which was once a famous Deity among the Egyptians. They are diſtant from each other about two paces,and are 20 feet long. I walk'd in four Alleys ending at four Gates of the Caſtle ; and for ought I know there may be more of them,ſeeing I went but half round the Caſtle, which is very ſpacious. I reckon'd 60 of them on one ſide of one Alley, and as many over againſt it ; and 51 in another Alley ; all well meaſur'd. The Alleys are of the largeneſs of a Pal-mall : the Gates of that Caſtle are of an extraordinary height cover'd with moſt excellent ſtones. Meaſuring one which maketh the height of one of them, I found it 26½ foot long,and proportionably thick. I believe,that there are above a million of Figures in profil, none in front : I ſpeak of thoſe that are graven on the Walls and Pillars. I ſhould have needed a whole Month to obſerve all the particulars of that place. I did content my ſelf to draw only the poſtures of a douzen of the moſt extravagant *Dæmons* together with their Adorers of both Sexes ; and ſome Frontiſpieces of Temples, which are not very rich in Architecture,but built of very fine ſtone. That which moſt pleas'd me was the ground, where the Azure and the other Colours, which are like enamel,appear as freſh as if they had been laid on but a month before. There are Temples ſo ſpacious,that 3000 people may ſtand on the roof with eaſe. In the ſame Caſtle there is a Pond, the water whereof is bitter,ſet about with fine ſtones. This water is ſaid perfectly to whiten Linnen all alone ; which I tried not, but we dipp'd our handcherchief in it, which kept the ſent of Soap for four or five daies.

Theſe are the only curioſities I can ſend you of our Voyage which is not the fiftieth part of what was to be ſeen: but our time being limited we only could ſtay in two *places*;our deſign not being curioſity,but to ſatisfie the charge of the Miſſion among the Chriſtian *Cophthes* of that Countrey, which are in great number there, and have many Monaſteries and ancient Churches, but poor. We have paſſed many places, where was neither Prieſt nor Church,but only the poor people like ſheep without a Shepherd. I hope ſhortly to return thither,and not to come back again

gain with ſo much haſt, after I ſhall have made a little voyage upon the Red Sea, whither I go every year to viſit the poor Slaves in the Gallies of the Turks, &c. *F. Brothais.*

Extract of a French Letter, *written by* F. Jaques Paul Babin, *a Jeſuit, to* F. Ignatius Bardy *of the ſame Company, from* Negropont, *May* 15. 1670; *and lately communicated by the* Learned *Jeſuit* Berter *to a Friend of his in* London; *concerning the Flux of the* Euripus.

ALthough the *Euripus* be a Symbol of inconſtancy, yet hath it this advantage, that whereas the great things, which the Antients have recorded of the Cities and Rivers of *Greece*, are or appear no more in being, the *Euripus* ſtill remains what it hath been. 'Tis true, that the Town of *Chalcis* is deſtroyed, but in the place thereof, we may ſee that of *Negropont* in *Eubœa*, which is ſever'd from *Bœtia* only by an Arm of the Sea, where this *Euripus* is found; over which are built two Bridges, one of Stone, the other of Wood; in the middle whereof is a Rock, on which the *Venetians* formerly built a Caſtle, which on its Gates doth yet ſhew the *Lions*, the Arms of the City.

I have not contented my ſelf with reading what Antient Writers have left us of this *Phænomenon*, who did either not ſee it or not conſider it with that carefulneſs and attention I have done, having made upon the place long Obſervations, which were found conform to thoſe intelligent Natives, of whom I made inquiry, eſpecially the Turks, that have the care of the Mills of this *Euripus*, and know all the times when the Wings and Wheels of them are to be mov'd and turn'd according as the Water of this *Streight* by its flux and reflux changes its courſe.

The *Euripus* then is a Streight of the *Ægean* Sea, ſo narrow, that a Galley can ſcarce paſs through it, under a Bridge, built between the Cittadel and the Donjon of *Negropont*. But not only this place, where the Bridge is, is call'd the *Euripus*, but alſo ten or twelve leagues on each ſide of it, where the Chanel being more large, the inconſtant courſe is not ſo ſenſible, as at the foot of the Caſtle. For three or four leagues on each ſide there are found ſix or ſeven Gulfs, wherein this water ſhuts it ſelf up, to iſſue from thence as often as it enters there; and the ſcituation of theſe Gulfs contributes to the odneſs of this flux and reflux; of which the Moon ſeems to be the principal cauſe.

There are twenty daies of each Moon, in which the courſe of the *Euripus* is regular, and ten, in which 'tis irregular; that is to ſay, five daies before and five daies after the New and Full Moon, the courſe of it is regular and ſtrong; and then you ſee there the like phænomena with thoſe of the Ocean at *Bourdeaux*. The Sea hath two Fluxes and Refluxes in twenty four hours, and every day it retardeth almoſt an hour. But there are nine or ten changes of the courſe of the water during the remaining ten daies of inequality; unleſs it blow hard, for then the courſe changeth not above ſix or ſeven times. I once ſtayed on the Mill (which is under the Bridge,) 1½ hour, and I ſaw the courſe of the water change thrice, though the wind was pretty high; and the Wheels of the Mill turn'd as often divers waies. Monſieur de la *Hogue*, a Pariſian Gentleman, being curious, ſtaied there almoſt a whole day with a Janiſſary; and the Moon being near the Full, he obſerv'd the ſame thing that happens in the Ocean. But though he deſign'd to ſtay there full twenty four hours during the irregular daies, he was diſſwaded from it for fear of the Turks, that might take him for a Spie and do him ſome miſchief.

I ſaid, that for twenty daies the Flux and Reflux is as in the Ocean, or as at *Venice*; but with this difference, that the water of the Ocean riſes many feet high; but in the *Euripus* it riſeth not much above a foot: beſides, in the Ocean 'tis obſerved, that the water in its riſing flows *into* the *ports* and *towards* the Land, and in its full runs *into* the *Main*; but in the *Euripus* when the water riſeth, it runs then into the Sea, and when it ſinks, it flows into the channel going towards *Conſtantinople*.

The ſmall Gulfs, that are on the left ſide of the port of *Negropont*, are fill'd when the water riſeth; and emptied, running towards *Theſſalonica* or *Conſtantinople*, when it deſcends. I wrote to the F. *Vabois*, deſiring him to obſerve; and he took notice of the ſame at *Conſtantinople*, *viz.* that the waters of the *Black Sea*, that come from *Conſtantinople*, drive the *Euripus* in its riſing towards the main Sea, and that there-after the waters retire themſelves towards the ſame place again whence they came.

I cauſed the ſame perſon to make another obſervation, which was, That that ſwelling of the *Euripus* which is irregular, laſted not above a good quarter of an hour, and the ſinking thereof, three good quarters, though then the water ran with more rapidity, and ſeem'd to us to come away in thrice as great plenty, than when he ſaw it riſe. I know not whether this proceeded from the wind, not being able to aſſure you, that this effect is ordinary, till I have oftner obſerved it.

Between the aſcent and deſcent there is a little interval, wherein the water ſeems to be at reſt and ſtagnating, ſo that, it there be no wind ſtirring it, bits of wood and ſtraw lye ſtill upon the water without motion.

From what I have ſaid, 'tis not difficult to reconcile the Authors that have written ſo differently of the *Euripus*. For thoſe that have ſaid, that there is nothing in it but what is ſeen in the Ocean, that is, *Two* Fluxes and Refluxes in twenty four hours, have only obſerv'd it in thoſe twenty daies of its Regularity. And the Antients have not deliver'd a falſhood, when they ſay, that there are *Seven* Reciprocations in one day, becauſe that happens when the Winds trouble and retard the Cours of the water: and I do aſſure, by often reiterated Obſervations, that when 'tis ſtill weather, the Flux and Reflux is made even to nine or ten times in a natural day.

A Relation of two conſiderable Hurricans, *happened in* Northampton-ſhire, *not above four miles diſtance from one another, within the compaſs of leſs then twelve Calendar-Months: Communicated by Mr.* John Templer *of* Braybrook *to a Friend of his in* London.

O*Ctob.* 30. 1669. Betwixt five and ſix of the Clock in the evening, the wind Weſterly, at *Aſhley* in *Northampton-ſhire* happen'd a formidable *Hurrican*, ſcarce bearing ſixty yards in its breadth, and ſpending it ſelf in about ſeven minutes of time. Its firſt diſcern'd aſſault was upon a Milk-maid, taking her pail and hat from off her head, and carrying her pail many ſcores of yards from her, where it lay undiſcover'd ſome days. Next, it ſtorm'd the Yard of one *Sprigge*, dwelling in *Weſtthorp* (a name of one part of the Town,) where it blew a Waggon-body off of the axle-trees, breaking the wheels and axle-trees in pieces, and blowing three of the wheels ſo ſhatter'd over a wall. This waggon ſtood ſomewhat croſs to the paſſage of the wind. Another waggon of Mr. *Saliſburies* marched with great ſpeed upon its wheels againſt the ſide of his houſe to the aſtoniſhment of the inhabitants. A branch of an *Aſh-tree* of that bigneſs that two luſty men could ſcarce lift it, blew over Mr. *Saliſburies* houſe without hurting it, and yet this branch was torn from a Tree, an hundred yards diſtant from that houſe. A Slate was forced upon a window of the houſe of *Samuel Templer* Eſq;, which very much bent an Iron-bar in it; and yet 'tis certain, that the neareſt place, the Slate was at firſt forc'd from, was near two hundred yards. Not to take notice of its ſtripping of ſeveral houſes; one thing is remarkable, which is, that at Mr. *Maidwells* Senior it forced open a door, breaking the latch, and thence marching through the entry, and forcing open the Dairy-door, it over-turn'd the milk-veſſels, and blew out three panes or lights in the window; next it mounted the Chambers, and blew out nine lights more. From thence it proceeded to the Parſonage, whoſe roof it more than decimated; thence croſſeth the narrow ſtreet, and forcibly drives a man headlong into the doors of *Thomas Briggs*. Then it paſſed with a curſory ſalute at *Thomas Marſtons*, down to Mr. *George Wignils*, at leaſt a fourlongs diſtance from *Marſtons*, and two fourlongs from *Sprigg's*, where it plaid notorious exploits, blowing a large hovel of peaſe from its ſupporters, and ſetting it cleverly upon the ground, without any conſiderable damage to the thatch. Here it blew a gate-poſt, fixed two foot and an half in the ground, out of the earth, and carried it into the fields many yards from its firſt abode.

In this caſe, the Scite of that part of *Aſhley*, moleſted by this wind, is conſiderable with the Poſition of the field to the then point of the compaſs, wherein the wind ſtood. About ½ a mile diſtant from the Town is a ſmall Wood on the top of an Hill, and partly deſcending into a Vale encompaſſed by Northerly and Southerly Hills; ſo that the wind may ſeem confined to the Vale as a channel before it aſſaulted the Town, and thereby enforced to ſpend it ſelf only in that glaad.

But I am not unapt to think, that ſome *flatûs* from the deſcending Wood-ground might contribute to this accident, becauſe the wind continued, ſo far as men could judge, as high in the field afterwards, and the ſcite of the Town did expoſe (by reaſon of thoſe Valleys) a far greater part of the Town to this damage than was troubled, the Valley being above four or five times the breadth of that part of the Town concerned in it.

The *other* Inſtance was *Octob.* 13. 1670. at *Braybrook*, likewiſe in *Northampton-ſhire*, about eleven a Clock; when the wind, in a ſtrange ſtorm aſſaulted a Peaſe-reek in the field, uncovering the thatch of it, and leaving another within twenty yards unconcerned. Thence it proceeded alſo to the Parſonage, where it carried not twelve, ſcarce eight yards in breadth, blowing up the end of a Barley-reek and therewith ſome ſtakes in it of near five foot long: In the mean while it left a Wheat-hovel, within ſix yards of the Barley-reek, and being without all ſhelter, untouched, no part of the thatch of the hovel being ſo much as furled. Nevertheleſs it beat down a Jack-daw from the reek with that violence as forced the guts out of the body, and made it bleed plentifully at the mouth. This I ſaw, and took up in ſome company, the Daw very warm. Thence it went in a right line to the Parſonage-houſe, took off the cover of all the houſe in its compaſs. From hence it paſſed over the Town without any damage, the reſt of the Town being low in ſcituation, and went on to a place called *Fort-hill*, where it uncloathed ſo much of a Mault-houſe as lay within its line and breadth, ſo as to expoſe the Mault upon the floor to the open air.

Here may be noted, that *Braybrook* ſtands in a Valley environ'd by hills on three ſides at three quarter of a miles diſtance from it. But (what I would chiefly obſerve,) there is an Hill, called by the name of *Clack-hill*, within a mile of it, and exactly in that point of the compaſs in which the wind then ſtood; no hill in its way till the wind had paſſed over all the places it endamaged: And, which is remarkable, there have been two Earth-quakes in this Town within theſe ten years, when the then gentle Air (or Wind ſhall I call it) only vibrated upon that point of the Compaſs.

A Narrative of two Petrifications *in Humane Bodies, communicated by Mr.* Chriſtoph. Kirkby *in a Letter from* Dantzick, *dated April* 8. 1671.

THe following Obſervations (which to me ſeem uncommon,) were communicated to me by an Ingenious Doctor, my acquaintance, concerning *Petrification* in Humane Bodies; and although you may perhaps have others of the like nature, yet I doubt not but theſe may have their uſe, at leaſt they confirm others.

A woman of 56 years of age, unmarried, whoſe whole courſe of life had been extreamly ſedentary, was troubled, ſome years before her death, with great pains in her back, eſpecially towards the right ſide, and a continual inclination to and effective vomiting; whoſe urine, for ſome time before, was turbid, and as 'twere mingled with blood; yet totally void of ſalſuginous matter. She was under the hands of the beſt *Doctors* in this place, who adjudged that Symptom of Bloody water to have proceeded *ex præmatura ceſſatione menſium* (which left her in the fortieth year of her age;) thereby perhaps deceived, becauſe there was never either ſtone or gravel voided by her. But her laſt *Doctor* (from whom I have this relation,) adjudged it to proceed *ab affectu Nephritico & quidem graviſſimo*. This perſon, when dead of theſe diſtempers, was opened by this her laſt Phyſitian, and among many other common *Phænomena* he found the left *Kidney* filled with large ſtones, but the right wholly petrified, covered with the ordinary skin without any fleſh; the half of which (the other being broken by injurious diſſection) repreſenting ſtill the Kidney, I have ſeen, which was both maſſy and ponderous, ſo concreted by the cloſer coalition of minute ſand, which might be rubbed off by your finger.

The other was a Lad about nineteen years old, who from his Cradle was diſpoſed to a Conſumption, accompanied with continual Coughing, great emaciation and continual heat, ſo that he was reduced to a *Sceleton*, and labouring under this diſtemper died. Being opened, a great quantity of watry matter run out at the *abdomen*, of a chylous conſiſtence; moſt, yea almoſt all the glanduls of the Meſentery, through which paſs the *venæ lacteæ*, were extraordinary great and hardned beyond the hardneſs of a *Scirrhus*. The Breaſt being opened, the Lungs were found grown to it round about, almoſt inſeparable, full of purulent ulcers, but more eſpecially the left ſide, obſtructed and filled with much gravel and ſmall ſtones; yea, whole pieces of the Lungs, eſpecially the extremities, about the thickneſs of a finger and more, were hardned into a ſtony matter.

An Accompt of Four Books.

I. *Franciſci de le Boe Sylvii* PRAXIS MEDICÆ *Idea nova*, Lugduni Batav. 1671.

THe Learned and Experienced Author of this work, deſiring to furniſh his Auditors with a compendious *Medical Practiſe*, and to do it after the Method of that Excellent and Happy Phyſitian *Platerus*, did propoſe to himſelf to handle chiefly of the more *Simple Affections* of the Humane Body, becauſe they being well underſtood, the knowledge of thoſe that are *Complicate* will not be difficult to attain.

But conſidering with himſelf, that Mans good Health conſiſts in and is known by the Integrity and good diſpoſition of all his *Functions*; and want of Health, in and by the indiſpoſition and depravation of the ſame, he thought fit to treat of thoſe Affections, that occur in the Practiſe of Phyſitians, according to the difference of thoſe depraved Functions. And foraſmuch as theſe Functions ſerve either for the *Conſervation* of the *Individual*, or the *Propagation* of the *Species*; and the former of theſe is conveniently ſubdivided into the *Natural*, ſerving for the various charge of ſubſtances taken inwardly, and the *Animal* Functions, conſiſting in the knowledge of all ſorts of things by the External and Internal ſenſes, as alſo in the various Motion of the Soul and Body; He therefore diſtributeth this whole *Praxis* into *three* Books, which treat of the *Affections*, reſpecting the Indiſpoſed *Functions* of Man. I. The *Natural*. II. The *Animal*; and *III*. Thoſe that ſerve for *Generation*.

We ſhall not enlarge here by repreſenting any particulars of this Work, but refer the Judicious Reader to its peruſal and conſideration, by which as he will doubtleſs meet with many uſeful Medical Preſcriptions and Remedies, ſo he will not find it barren of conſiderable Obſervations and Experiments relating to Natural Philoſophy, and in particular to Anatomy.

II. *Relatione dello Stato preſente dell' EGYPTO, ſcritta dal Sig. Gio.* Michaele Vanſlebio, *è dedicata al Grand Duca di Toſcana. In* Parigi, 1670. *in* 12°.

PAſſing by what this Relation obſerveth of the Political Government of *Egypt*, and the Original Language and Religion of the *Cophthes*, (which maketh a great part of the Book, but is not ſuitable with the deſign of theſe Tracts,) we ſhall take ſome notice of what it delivers concerning the Natural State and Productions of the Country, the Oeconomy of the Inhabitants, and the Magnificent Structures yet remaining there.

Firſt then the Author obſerveth, that the winter of *Egypt* is ſo mild, as to be like to the March-air of *Rome*; and that the uſual time of *Rain* is in the months of *December*, *January* and *February*, and that principally about the Sea-coaſt: Of *Tempeſts*, from Eaſter to Whitſontide, when the Wind is for the moſt part Eaſterly: Of the moſt agreeable weather, in *November* and *December*, when the Countrey is dry'd again from the *Nile* waters, and all things in a verdure, the winds gentle and the Sun tolerable: Of the violent heats, in *April*, *May*, *June*, and further till the inundation of the *Nile* cooleth the Air; which begins in *July* and ends in *September* or *October*; and proveth the great and general manure of that Country, when it ariſeth above ſixteen *braccia* or Italian Ells; beneath which when it ſtops, the Inhabitants are not obliged to pay any tribute to the G. *Signior*. The cauſe of this Inundation as 'tis principally the plenty of rain falling in *Abyſſinia*, ſo this Author taketh in the *Northerly* winds beginning in *June*, and laſting till *October*, and hindering the waters of the *Nile* from diſcharging themſelves into the Mediteranean. Theſe waters being generally eſteem'd very good, are clear'd from their turbidneſs by bitter Almonds beaten and thrown in.

When he ſpeaketh of the Animals of *Egypt*, he taketh particular notice of the great variety and abundance of *Birds* there.

When he ſpecifieth the vaſt number of *Vegetables*, he giveth an account of the various uſes of the *Dactil-tree*, and particularly, that the ſtones of *Dates* are given to *Camels* in long voyages; as alſo, that Horſes as long as they feed upon *Trefoil*, have no drink given them.

Treating of the *Foſſils* of Egypt, he obſerveth, that their *Niter* is moſt abounding in the Deſert of St. *Macare*; and that about *Thebe* there is digged up ſtore of Marble, Porphyre, Alablaſter, Granates, &c.

Secondly, as to the *Oeconomy* of the Egyptians, he relateth at large their practiſe of Agriculture, and noteth, that they do not cut, but pull up their Corn, and that their Corn-harveſt is from the middle of *April* to the middle of *May*; yea that ſometimes even before the middle of *April* new bread is eaten in *Cairo*. In Villages, for want of Ovens, they bake their Bread under the hot Aſhes; and, in making their bread, ſome put *Niter* into the dough, to raiſe and colour it: which muſt be eaten new, or elſe 'tis not good. Among their Drinks they have 1. *Meath*, which, though it inebriateth, yet they are permitted to drink, though wine be forbidden them: 2. A Liquor very refreſhing, made by the *Mores* of *Licoriſh*.

As to their way of Building, diſtinctions obſerv'd in Cloathing, and their Fuel, I refer to the Authour himſelf.

Thirdly, concerning the remainders of the Antient Buildings this Author delivers many particulars, conſonant to what others have written of the ſame, as *Pyramids, Obelisks, Aqueducts*, the Colomn of *Pompey*, &c.

III. *Theod Kerckringii M. D. Commentarius in CURRUM TRIUMPHALEM ANTIMONII Baſil. Valentini, à ſe Latinitate donatum.* Amſtelodami, 1671. *in* 12°.

THis Learned Phyſitian aſſureth the Reader in the *Preface* to this Book, that having carefully peruſed the Antimonial Treatiſe of *Valentin*, he tried all the particulars, ordered therein to be done; but that in the performance thereof he erred frequently, and was at great expences without ſucceſs, yet not by any default of the Author, but alwaies his own; eſteeming this *Baſil* to be the beſt, the ſincereſt and the cleareſt of all Chymiſts he knoweth, and engaging his credit, that he being well underſtood, you may have what ever can be hoped for from Chymiſtry; Nature having lodged, as he thinks, all her Treaſures in this Mineral, p. 42.

In his Commentary upon this *Chariot* he intimateth to have delivered ſome *Encheireſes* or Manual Operations, which, how ſlight ſoever they may ſeem, he ſaith have coſt him man thouſands; adding, that patience in ſearching, ability in expending, unwearied attention and deep meditation, are the requiſites to attain the knowledge of what is here contained.

Of the many things, that are ſaid concerning the excellent uſefulneſs of *Antimonial* Preparations, our Commentator extols in a very eſpecial manne r the *Red Oyl of the Glaſs of Antimony* of which yet he teacheth the way of preparing it but ænigmatically, though he adds, to have done it more clearly than any body declared it to him. This he affirms to be the truly *Univerſal Medicine*, being ſeaſonably and rightly uſed; alledging (p. 164. 165.) a conſiderable Experiment of his own, made with it, importing, that by the means of this *Diaphoretick Oyl* alone he cured a young woman of a high *Dropſie* in twenty daies, making her on the fourth and the following days ſo to ſwim in water from ſweat, that it dropped at length through the bed upon the floor.

B. ſides

Beſides this, he much praiſeth, for *Chirurgical* uſes, the *Balſom* or *Tincture* of the *Sulphur of Antimony*, affirming upon his credit, that *Baſil Valentin* hath not given the full due to its worth; and relating withall (p.157.158.)the Hiſtory of a Cure, he performed with it upon a cancred Breaſt, that had been under the hands of ſome of the moſt expert Chirurgions, who judged it not curable but by cutting it off; which our Author prevented by the uſe and application of this Balſom, whereby within two days the matter was brought to due maturity, and, upon the joint uſe of ſome proper internal Medicines, the perſon in the ſpace of two months reſtored to perfect health.

There is another Preparation of Antimony here deſcribed, and praiſed above all the reſt, call'd by *Baſil*, his *Balſom of Life*, by which he affirms to have cured many that were altogether deſpaired of, appealing herein to the teſtimony of his Brethren. In which he is ſeconded by this Commentator, who declareth, that in this Medicine is contained not only what can be made of Antimony, but almoſt all, what can be prōſed by a Spagyriſt.

For the other particulars we ſhall leave the Reader to the careful peruſal of the Book it ſelf, and the cautious trial of the Experiments and Operations contain'd therein.

IV. *Cogitationes Phyſico-Mechanicæ de Natura VISIONIS Auth.* Johanne Ott *Schaphuſa-Helvetio*. Heidelbergæ 1670. *in* 4°.

THis Author ſhews himſelf to be a great Admirer of *Algebra*, aſſerting this *Theſis* about it, in one of the Corollaries annexed to this Book:

Analyſis Geometrarum vera eſt methodus inveniendi & demonſtrandi; ipſiuſque ratio à Carteſio *tradita quicquid Syntheſis habet egregii, Cavallerii Methodus Indiviſibilium abſtruſi, Thomæ Hobbes Computatio veri & ſolidi, & Analyſis Veterum abſconditi plenè continet.*

And whatever he hath perform'd, he profeſſeth he hath obtain'd by means of this *Analyſis*; ſaying thus in his Dedication.

Ex quo Teleſcopiorum Inventum mundo innoteſcere cœpit, varii variam illius rationem reddere conati ſunt, & quidem omnes ferè non-niſi ex Sphæræ ſectione Tuborum lentes polire tentârunt, donec Carteſius *tandem Sectiones Coni negotio Dioptrico aptiores eſſe demonſtraret. Non tamen defuerunt, qui contrarium aſſerendo, aut omnino inutiles eſſe affirmando, demonſtrationibus* Carteſii *obſtreperent.*

ſtreperent. Mecum verò omnium rationes perpendens, Carteſii *ratiocinium firmo talo niti, Analyſeos beneficio deprehendi; nec ulla in re hæſitavi, quàm quomodo figuræ illæ in Plano delineari aut ſolidæ materiæ induci poſſent. Ipſius enim* Carteſii *machina nimis compoſita videbatur, motuſq; nimium complicatus; adeóque commiſſo in unico levi errore non poſſe non majorem ſucceſſive generari, extra dubium erat. Quamobrem machinam quandam ſimplicem conficiendam eſſe, linearum Conicarum naturam requirere ſenſi. Monente autem Clariſſ. Dom.* Spleiſſio, *Mathematico ſubtiliſſ. & Aſtron. Incomparibili, operi me accinxi, ac in ſubſidium vocatâ methodo ſeu Geometria* Carteſii, *ante triennium Machinam quandam fabre-fieri curavi, quæ ſimplicitate ſuâ & motûs regularitate nulli alii cederet; ea autem paucos ante menſes ultimum perfectionis ſuæ gradum conſecuta eſt. Abſolutâ autem machinâ, operi me confeſtim applicui, ferro inducendo figuras Conicas, præcipuè verò Hyperbolas & Parabolas, quarum focus* 1.2.10.25.50. *pedes & ultra à vertice abeſſet. Præterquam enim quòd Inſtrumento meo cujuſcunq; generis* Hyperbolæ, Ellipſes ac Parabolæ *deſcribi queunt, ut &* Circuli *ſegmentum quodcunq;, id tamen quod machinæ perfectionem commendat, hoc eſt, quòd nullo limite claudatur ipſius Uſus; vix enim ſex pedes maximâ ſua extenſione ſuperat machina, ipſius tamen ope, Arcus* Circuli, Ellipſis, Parabolæ, atq; Hyperbolæ *delineari poterit, qui vitro inſculptus tubum* 10, 100, 1000 *pedum requirat. In proxima verò Sylvæ* Herciniæ *vitraria, modulis beneficio cuneorum confectis Vitra infundere curavi, quæ quamvis inutilia fuerint ob materiem impuritatibus ſcatentem, attamen Coni Sectiones maximè accommodatas eſſe Dioptrico uſui, ipſaſq; in Plano delineari poſſe deprehendi; ita ut mediante machina mea celeberrimam iſtam inter nobiliſſimos mathematicos agitatam controverſiam determinare poſſim.*

Concerning his Dioptrical Studies he ſaith, that remote from other Maſters and Books, by the conduct of the Carteſian *Analyſis* he hath begun to wind himſelf by a long *Calculus* out of the Labyrinth of Viſion, and by the means of *Æquations* diſcover'd divers truths both theorical and practical; among which he delivers one, which commends it ſelf both by its newneſs and uſefulneſs, which is, To contract the longeſt Tubes, without at all prejudicing their perfection, by magnifying ſo much the angle of Viſion, that the longeſt Tube ſhall not perform the like, the Lateral rays being ſo accurately ſecluded, that more of them ſhal

trouble any of the longeſt Tubes, then thoſe ſhort ones of his contrivance; of which he ſaith he hath given the grounds in this Tract: Wherein he affirms he delivers an *Hypotheſis*, whereby the *Nature* and *Manner* of *Viſion* is ſo clearly and diſtinctly exhibited, that no *Phænomenon* ſhall occur which may not be readily explained thereby; aſſuming to this end the moſt ſignal Experiments and Geometrical reaſons; and explicating withall ſome *phænomena*, conducive to the ſame; as of Firmneſs, Fluidity, Refraction, Reflection, Lucidity, Tranſparency, Opacity, Colors, and the Parts of the Eye: In the doing of which he inſerts this generous and candid Paragraph, pag. 7.

Miſſis illis occultis qualitatibus & ſimilibus, nunquam à quoquam revelandis, eorum Philoſophorum modum ſequi magis arridet, qui Regiam viam, deſertis dumetis & ſpinis, calcare malunt, ex claris & diſtinctis principiis exordium capeſſendo, atq; Experimentis Ratiocinia, in rebus præſertim Phyſicis, confirmando, in auxilium vocatis Geometrarum demonſtrationibus, ad normam Regiæ indolis, Societatis Anglicanæ; quorum inſtitutum ſi à ducentis jam ſeculis proſecutum fuiſſet Genus humanum, & amicâ conſpiratione eorum viam legiſſet, quin Naturæ penetralia intimius perſpecta haberemus, & Naturæ quaſi Domini ſalutaremur, ego nullus dubito. Nunquam tamen deſuerunt, qui id pro viribus præſtiterunt, præſertim Mathematici & Veterum Philoſophorum nonnulli; quamquam opus illud non ſit unius alteriuſve hominis, ſed plurium, imò integræ cujuſdam Societatis, ex diverſis tum nationibus tum locis coagmentatæ.

For the reſt the Reader may peruſe the Book it ſelf; of which yet I fear there are but very few *Copies* hitherto come over, if any more than that, out of which this Accompt is given.

An Obſervation concerning certain Inſect-husks of the Kermes *kind communicated by Mr.* Liſter, *May 22. 1671. which came to hand ſince the Printing of the former ſheets.*

I Gave you a ſhort account formerly * of certain *matrices* or Inſect-husks, of the *Kermes*-kind, which I had ſome years ſince obſerv'd on Plumb-trees. This inſtant *May* hath afforded me the ſame Obſervation, and ſome little improvement of it. I have obſerved the ſame *Patellæ* or Husks indifferently

* *March* 17, 167$\frac{0}{1}$. I find in my *Notes* (ſaith he) that ſome years ago I gather'd off our Engliſh Oak round Worm-husks very like *Kermes*-berries, but I then made no tryal of them. Again, I have often obſerved on *Plumb trees* and *Cherry-trees*; alſo on the *Vine* and *Cherry-Laurel* certain *patellæ* or flat Husks containing worms, which (or at leaſt the husks; for them only I had the opportunity of making the Experiment on) will ſtrike a Carnation with Ly and ſtand.

rently on *Vine-branches*, *Cherry*-Laurel, *Plumb-trees*, and the *Cherry tree*. The *figure* of the husks is round, ſave where it cleav'd to the branch; for *bigneſs*, ſomewhat more than half a grey pea. Theſe, I ſay, cleave to their branches, as *patellæ* do to Rocks: For *colour*; they are of a very dark Cheſnut, extreamly ſmooth, and ſhining membran-like. They adhere moſt commonly to the under-ſide of a branch or twig, and ſo are beſt ſecur'd againſt the injuries of the weather, as too much Sun and Rain. They are well faſtned to the branches ſingle, and ſometimes many in company. They are ſeldom found without vermin, as Piſmires, &c. which, I gueſs, pierce them and pray upon them. Thus much for the entire *Coccum*. If you open one of them, that is, cut off dextrouſly the top of the husk with a raſor, you'l find ſometimes five or more ſmall white magots of the Waſp or Bee-kind, that is, ſharp at both ends. When theſe are carefully taken out, you will further obſerve the remainder of their proviſion of meat, and a partition 'twixt them and the branch, where, what they excerne, is reſerv'd. Laſtly, if, when you have clear'd the Husk of Maggots, Bee-meat, and excrements, you then rub the empty membran upon white paper, it will freely and copiouſly tinge the paper with a beautiful purple or murrey. At the *date* of this, none of the Maggots were yet in *nympha*, ſo that you cannot expect from me a deſcription of the Bee or Waſp they will turn to, when they come to perfection. Before the ſeaſon be over, the Curious may ſatisfie themſelves forthwith about it, and verifie and improve it. Few *Cherry-trees*, I ſuppoſe, in any place, but will yield them ſome of theſe Berries. How-ever, if they ſhall not be ſo fortunate as to light on them, I ſhall furniſh you with them, &c.

ERRATA.

2148. *l.* 17. *r.* it is. *p.* 2153. *l.* 15. *r.* Bæotia.

LONDON,
Printed for *John Martyn*, Printer to the *Royal-Society*. 1671.

Numb. 72.

PHILOSOPHICAL TRANSACTIONS.

June, 19. 1671.

The CONTENTS.

A Curious Relation of a Subſtance found in great quantities in ſome Mines of Italy, *out of which is made a kind of Incombuſtible both Skin, Paper, and Candle-week. Some Experiments ſhewing the difference of* Ice *made* without *Air, from that which is produced* with *Air. Extracts of three Letters*; one, *concerning ſome Philoſophical Inquiries abont* Spiders, *together with a* Table *of 33 ſorts of Spiders to be found in* England; *as alſo of a kind of* Viviparous *Fly: The* ſecond, *about an Inſect feeding upon* Henbain, *and thereby qualifying in its body the horrid ſmell of that Plant; and altering it to an Aromatical and agreeable one: The* third, *containing ſome Obſervations of* Glow-vvorms. *An Accompt of ſome Books:* I. *Of the USEFULNESS of EXPERIMENTAL NATURAL PHILOSOPHY, the Second Tome, by the Honourable* Robert Boyle. II. *Enchiridion METAPHYSICUM, ſive de REBUS INCORPOREIS Diſſertatio, per* H.M. *Cantabrigienſem.* III. *Diophanti Alexandrini ARITHMETICORUM Libri ſex, cum Commentariis C. G.* Bacheti, & *Obſervationibus D. P. de* Fermat, *annexo Doctrinæ ANALYTICÆ Invento novo.* IV. *The* Prodromus *of a Diſſertation concerning a SOLID naturally contained in a SOLID, by* Nicol: Steno. V. *Roſetum GEOMETRICUM* Thomæ Hobbes *Malmesburienſis. An Advertiſement concerning an* Engliſh *Impreſſion of* Vitruvius.

A Curious Relation, taken out the third Venetian Journal de Letterati, *of* March 15. 1671; *Of a Subſtance found in great quantities in ſome Mines of* Italy; *out of which is made a kind of incombuſtible both Skin, Paper, and Candle-week, together with the Experiments made therewith.*

SIgnor *Marco Antonio Caſtagna*, Superintendent of ſome Mines in *Italy*, hath lighted in one of them upon a great quantity of that Lanuginous Stone, called *Amianthus*, which he knows ſo to prepare, as to render it ſo tractable and ſoft, that it reſembleth well enough a very fine Lambs-skin dreſſed white. He thickens and thins it, to what degree he pleaſeth, and thereby maketh it like either to a very white Skin, or to a very white Paper; both which reſiſts the moſt violent fire, as hath been experimented ſeveral times. Firſt, The Skin was cover'd with kindled coals, whence it took flame, but being taken out after it had been left there a while, the fiery colour preſently diſappear'd, and it became cold and white again as before; the fire, it ſeems, paſſing only thorough, without waſting or altering any thing of it; whereas ſome of the hardeſt and ſolideſt Mettals, as Iron and Copper, reduced to very thin plates, and kept as long in the fire as this ſubſtance was, would caſt Scales. Again, This Skin being made as thin as Paper, doth not only yeild that ancient and ſo much admired *Amianthus*, but is alſo perfecter than that which comes from *Cyprus*, and not inferiour to that, which ſometimes, though but ſeldom, comes out of *China*. This Paper was alſo tryed in the fire, and there it remained likewiſe without any viſible detriment, or without the leaſt change of its firſt whiteneſs, fineneſs, or ſoftneſs. Of the ſame matter this Artiſt hath wrought a *Week*, never to be conſumed as long as 'tis fed, nor altering its quality after the aliment is waſted away. And if that famous and incombuſtible Oyl were found out again, we read of, this matter would yeild the Week for that everlaſting Light, ſo much celebrated by the Antients.

The Inventor promiſeth to make further Experiments with this ſubſtance, for other diſcoveries. At the preſent he is reſolved to prepare of it ſuch a quantity of Paper, as may make a Book, and to cover it with the Skin made of the ſame, and to ſow it together with thread made of the ſame, and to write in it Letters of Gold; ſo that ſuch a Book, being made in all the parts of it incombuſtible, and everlaſting againſt the power and injuries of all the Elements, as being proof againſt the ſtrongeſt, and not being ſubject to Corruption from the other, as Water or Air, may deſerve *(he ſaith)* the name of the Book of Eternity.

Some Experiments of Signor Carolo Rinaldini, *Philoſopher and Mathematician in the Univerſity of* Padoua; *ſhewing the difference of* Ice *made* without *Air*, *from that which is produced* with *Air*: *In the ſame* Venetian Journal.

THere was taken a Glaſs-cane, about $1\frac{2}{3}$ of a Florentin *braccia* or Ell, open at one end, of which above one Ell and a quarter was fill'd with Quick-ſilver, the reſt with common water. This open end was ſhut with a finger, and inverted into a veſſel with ſtagnant Mercury; then removing the finger, the Mercury began to fall out, ſo that the aggregat of the Quick-ſilver and water falling, the water remain'd in the upper-part of the inverted cane, now free from Air. This being done, the Cane was thus expoſed to the open Air in the Month of *January*, in froſty weather, and in one night the water in it was congealed into Ice of a very good conſiſtence. Afterwards Signor *Rinaldini*, having compared this Ice with that which was produced in the open Air, found, that the Ice in the Cane was in ſubſtance altogether like that of Hail, that is, an opaque and whitiſh Body; whereas that, which was made in the Air, was tranſparent like Chryſtal. Beſides, he obſerved, that the Ice made in the Cane was heavier *in ſpecie* than that in the ambient Air: which he diſcover'd by putting it into a fluid, which was in *ſpecie* lighter than water, but heavier than Ice made in the open Air; whereby he found, that, whereas the Ice made in the Cane ſunk, that in the Air floated therein.

Which Experiment ſeems not to favour thoſe (ſaith the Author) who eſteem, that Ice, made in the common Air, is produced by the extruſion of Air latitant in the water, and by the reſolution of the more ſubtile parts, receiving in their ſtead the mixture of terreſtrial exhalations: conſidering that by the above mentioned Experiment it appears, that in the production of the Ice made in the open Air, the very Air is mixed with the Water.

But of theſe and many other things the Author (ſaith the *Journaliſt*) intends to diſcourſe in his *Natural Philoſophy*; where he means to ſhew, that 'tis not neceſſary, there ſhould be any vacuities in the Ice, and to teach, what is to be ſaid of the place deſerted by the *Mercury* whether it be void of all Body, or only of the Air, that was there.

A Letter written to the Publiſher from York, *Jan:* 10. 1670, *concerning a kind of* Fly *that is Viviparous, together with a Set of curious Inquiries about* Spiders, *and a Table of the ſeveral ſorts of them to be found in* England, *amounting to at leaſt* 33. *By Mr.* Martyn Liſter.

Sir,

I Return you thanks for your obliging Letter of the third of *January*, and have ſent you the *Viviparous Fly* and the Sett of Inquiries you deſire of me. The *Fly* is one, if not the very biggeſt, of the harmleſs Tribe that I have met with in *England*; I call them *harmleſs*, becauſe that they are without that hard Tongue or Sting in the mouth, with which the *œſtrum*-kind, or Gad-flyes, trouble and offend both man and beaſts. This Fly is ſtriped upon the ſhoulders grey and black, and as it were checkered on the tail with the ſame two colours: the *Female* may be known by a redneſs on the very point of the tail. The very latter end of *May* 1666, I opened ſeveral of them, and found two Baggs of live white worms of a long and round ſhape, with black heads; they moved both in my hand and in the un-opened Veſcicles, backwards and forwards, as being all diſpoſed in the Cells, length-ways the body of the femal, like a Sheaf.

Some ſuch thing is hinted by *Aldrovandus* lib. 1. de

Inſect. p. 57. *edit.* Bonon. *Tiro cùm eſſem* (ſaies he) *è grandioribus muſcis unam albis pictam lineis, ſpecie illectus, cepi; ea, in vola manus aliquandiu retenta, plusculos edidit Vermiculos candidos, mobilitate propria inſignes.*

This is the only Fly I have obſerved with live and moving worms in the belly of it; yet I gueſs, we may venture to ſuſpect all of this Tribe to be in ſome meaſure Viviparous.

With theſe Flyes I have ſent you a paper of thoſe odd-turned Snails *, mentioned in my former Letter, which perhaps you may think will deſerve a place in the Repoſitory amongſt the rarities of the R. Society.

* See *Numb.* 50. 1011.

Some general Enquiries concerning Spiders.

1. WHat ſorts of Spiders to be found with us in *England*, and what is the beſt method to diſtinguiſh them and to reduce them to *Claſſes?*

2. Whether Spiders come not of Spiders, that is, of creatures of their own kind? And whether of Spiders are bred Graſhoppers, *Cicadæ*, &c. as *Interpreters* falſly make *Ariſtotle* to ſay, firſt *Aldrovandus*, and lately *Kircher* (V. *Ariſt. Hiſt. Nat.* lib. 1. cap. 19. Confer Interpret. *Tho. Gazæ, Scaliger, Aldrov.*)

3. Whether Spiders are not Male and Female; and whether Female Spiders growing bigger than the Male, be ſufficient to diſtinguiſh Sexes.

4. Whether all kinds of Spiders be alike, as to the place and number of *Penis's*; and whether all the thread-yielding kinds, are not furniſhed with a double *penis*, that is, if the *Cornicula* or certain knobbed Horns, by which all Males are beſt diſtinguiſhed, be not each a *penis*, and uſed in the *Coit* alternatively?

5. Whether the Eggs in Spiders be not formed, and very large before the time of the *Coit?*

6. What Spiders breed in Spring, and what in Autumn? What Spiders are content with one brood in the year,

and to lay all their Eggs at a time? What ſeem to breed every Summer month, at leaſt to have many ſubordinate broods; and whether the Eggs be accordingly diſtinguiſhable in ſeveral *Matrices* or Cells in the body of the Female?

7. Whether Spiders do not take their form and perfection in the Egg, and are not thence hatched neceſſarily at a ſtated and ſet time, that is, after a certain number of days, as 21, compleat Animals of its own kind? and whether the preſence of the Femal be neceſſary in order to the hatching the Eggs, at leaſt for three days, as the Ancients ſeem to affirm?

8. Whether the perfectly-round eggs of Spiders ought to be called and eſteemed Worms, as *Ariſtotle* and *Pliny* will have them, that is, in *Swammerdam*'s phraſe and doctrine, Whether they be *Puppets* in the egg, and undergo all alterations accordingly, before they be thence hatched perfect Spiders?

Hiſt. Nat. lib. 1. c. 27. lib. 3. c. 9.

9. What different colours obſervable in the Eggs of Spiders, as well of pulps as ſhell, as white, yellow, orange, purple, greeniſh? and what reſpective tinctures they will give, or be made to ſtrike with the ſeveral families of Salts?

10. Whether there be not Eggs of ſome ſorts of Spiders, which the Worms of certain ſlender Waſps (the kind in general being called by *Mouffet Muſcæ tripiles*) delight to feed on? and whether the Fable of *Veſpæ Ichneumones*, told us by the Ancients, be not to be made out by the ſame Obſervation, of theſe Waſp-worms feeding on the Eggs, and perfected into Waſps in the very webs of Spiders?

Ariſt. Hiſt. Nat. lib. 1. cap. 20.

11. After what manner do Spiders feed; whether in ſucking they devour not alſo part of their prey? How long can they live without food, ſince they ſtore up nothing againſt Winter?

12. Whether Spiders feed only of their own kind of

Creatures, as of Inſects, that is, of Flyes, Beetles, Bees, Scolopendræ and even of one another? or whether they kill Snakes too, as the Ancients affirm, for food or delight?

13. Whether ſome of them chooſe not to feed on one ſort of Fly or other Inſect only; and what properties ſuch have?

14. When, and how oft in the year they caſt their Skins, and the manner of their caſting it? What variety of colours immediately after the ſhifting the Hackle in one and the ſame ſpecies of Spider, that may, if not well heeded, make the hiſtory of them more confuſed?

15. What mean the Ancients by Spiders caſting their threads, which *Ariſtotle* compares to a *Porcupins* darting her quills, or bark-ſtarting from a Tree; and *Democritus* to Animals voiding of Excrements?

Ariſt. Hiſt. Nat. lib.9.cap.39.

16. Whether the thread be formed in the Body of the Animal ſuch as it comes from it; I mean, whether it be, as it were, unwound off of a ſtock or clew, as I may ſay, and which indeed to me ſeems to have been *Ariſtotles* meaning; or whether it be drawn off of a liquid maſs, as in ſpinning of Glaſs or melted Wax, which ſeems to have been *Democritus*'s ſenſe, in ſaying, it was excrement corrupted or fluid at certain times?

17. Whether the Spiders thred being glutinous, every thing ſticking to it upon the lighteſt touch, be not ſo much the reaſon of the Spiders taking his prey, as the Figure of the Net.

18. Whether a Web be not uninflammable; and whether it can be diſſolved, and in what Menſtruum?

19. What difference 'twixt the thred of Spiders, and that of the Silk-worm or Caterpillars? What ſtrength a Spiders thread is of, and what proportion it bears with the like twiſt of Silk? Whether there be not ſtronger thread from ſome ſort of Spiders than from others, as there are threds from them of very different colours, as white,

greeniſh, blewiſh, dark hair-colour, *&c?* Whether the ſtrength of the *Barmudo* nets to hold a Thruſh, mentioned in one of the *Tranſactions* *, conſiſt in the thickneſs only, or much too in the nature of the thred?

*N°.50.p.795.

20. Whether its being to be eaſily drawn out at any time and at what length one pleaſes, and many threds together in ſpight of the Animal, be not as advantageous to the working of it up and twiſting, *&c.* as the unravelling the Cods of Silk-worms.

21. Whether either the viſcous ſubſtance of their Bodies or Webs be healing to green-wounds, *&c.* as the Ancients have taught us, and we uſe vulgarly? and whether ſome one kind of them be not preferable, for this purpoſe, before others?

22. What uſe may be made of thoſe Animals, which devour Spiders for their daily food, as *Wrens*, *Red-breaſt*, *&c*? Whether Spiders be a cure for ſick Poultrey, as the good Wives ſeem to experiment?

23. Whether the reaſon why Spiders ſail not in the air until Autumn, be not becauſe they are buſily employed the Summer months in breeding, or what other reaſons may be aſſigned?

The firſt article of Enquiry I have in part anſwered, by ſending you encloſed a Scheme, which, after ſome years obſervation, I have corrected and enlarged to what it is: yet I muſt acquaint you, that ſuch Draughts will be ever lyable to change and improvement, according to the meaſure of knowledge a continued Obſervation may bring us to. However it is the firſt, that I know of, that will be extant, on this ſubject, and it may be acceptable to the curious.

Tabulæ compendiariæ Araneorum Angliæ; quibus accedunt eorum Tituli, è notis maximè diſcriminantibus atque inſignibus deſumpti.

vel fila mittunt, ut ſunt qui

aut prædandi cauſa texunt

vel Reticula orbiculata, *numero* IX.

1. *Araneus ſubflavus, alvo paululum acuminata inflexaque.*

2. *Araneus rufus, cruciger, cui utrinque ad Superiorem alvi partem velut ſingula tubercula eminent.*

3. *Araneus cinereus, pictura clunium in 5 fere partes divulſa, iiſque plenis admodum.*

4. *Araneus flavus, quatuor albis, præter picturam foliaceam, in clune maculis inſignitus.*

5. *Araneus nigricans, clunibus ad ſimilitudinem querni folii pictis.*

6. *Araneus ex viridi inauratus, alvo prætenui procerâque.*

7. *Araneus cinereus, ſylvarum incola, alvo in mucronem faſtigiatâ, ſeu triquetrâ.*

8. *Araneus viridis, caudâ nigris punctis ſupernè notatâ, ipſo ano croceo.*

9. *Araneus pullus, cruciger in alvo plenâ.*

Plagas globatas, *n* IV.

10. *Araneus variegatus, alvo orbiculatâ.*

11. *Araneus rufus, clunium orbiculatorum faſtigio in modum ſtellæ radiato.*

12. *Araneus pullus, domeſticus.*

13. *Araneus cinereus macula nigra in ſummis clunibus inſignitus, minimus.*

Telas ſive linteamina, *n.* VIII.

14. *Araneus ſubflavus, piloſus, prælongis pedibus, domeſticus.*

15. *Araneus nigricans, prægrandi macula in ſummis clunibus, cæterùm iiſdem obliquè virgatis, domeſticus.*

16. *Araneus fuligineus è* Craven, *inſigni candore diſtinctus, caudâ bifurcâ.*

17 *Araneus ſubflavus, nigricantium macularum quadratarum catenâ in clunibus inſignitus, item cui utrinque ad clunium latera ſingulæ obliquæ virgulæ flaveſcentes.*

18. *Araneus cinereus, maximus, caudâ bifurca.*

19. *Araneus niger aut caſtaneus, glaber, clunibus ſummo candore interſtinctis.*

20. *Araneus cinereus, mollis, cui in alvo, obliquè virgatâ, macula latiuſcula è nigro rubens.*

21. *Araneus plerunq; lividus, ſine ulla pictura, alvo acuminata.*

aut ideo nihil texunt (niſi filorum ejaculatio ac volatus illorſum ſpectet) cum tamen alias poſſint: nimirum Telas ad tutandum fœtum aut ad hyberna, ſed aperto Marte muſcas venantur; atque ii ſunt

vel Lupi dicti. *n.* V. *Hi verò cum ſuperioribus ſingulis octo habent oculos.*

22. *Araneus ſubrufus, parvus, citiſſimo pede.*

23. *Araneus cancriformis, oculis è viola purpuraſcentibus, tardipes.*

24. *Araneus cinereus, alvo undulatim picta, inſignitèr procera, acuminata.*

25. *Araneus fuſcus, alvo obliquè virgata.*

26. *Araneus niger, ſylvicola.*

Phalangia, ſive aſſultim ingredientes, *n.* III. *Hi verò ſex tantum oculos habent.*

27. *Araneus cinereus, ſive ex argento nigroque varius.*

28. *Araneus ſubflavus, oculis ſmaragdinis, item cui ſecundum clunes tres virgulæ croceæ.*

29. *Araneus ſubrufus è* Craven, *ſive Ericetorum ſive rupium.*

vel omnino nulla fila mittunt, ut ſunt qui plerique

Longiſſimis tenuiſſimiſque pedibus donantur: *atque hi duos tantùm oculos habent, telaque ſive brachia digitata, n* IV.

30. *Araneus rufus, non criſtatus, gregatim vivens.*

31. *Araneus cinereus, criſtatus.*

32 *Araneus è candido nigroque varius, minima beſtiola, ſylvicola.*

33. *Araneus, ut puto, coccineus, vulgò dictus* a Tant Anglicé.

An Extract of a Letter from the ſame hand, May 30. 1671; concerning an Inſect feeding upon Henbain, *the horrid ſmell of which is in that creature ſo qualified thereby, as to become in ſome meaſure Aromatical; together with the colour yielded by the Eggs of the ſame,* &c.

Sir,

YOu may pleaſe to annex a late Obſervation to the laſt I ſent you: both being chiefly concerning the improvement of colours, and from the Inſect-kind.

There is a *Cimex* of the largeſt ſize, of a red colour ſpotted black, and which is to be found very frequently and plentifully, at leaſt in its ſeaſon, upon *Henbain*: I therefore in my private notes have formerly intitled it, *Cimex ruber maculis nigris diſtinctus ſuper folia Hyoſcyami frequens.* This Inſect in all probability doth feed upon this plant (on which only we have yet obſerved it) if not upon the leaves by ſtriking its trunk (the note of diſtinction of this kind of Inſect from the reſt of the Beetle-kinds) into them, and ſucking thence much of its ſubſtance, like as other ſorts of *Cimices* will upon the body of man, *&c*; yet upon the unctuous and greaſy matter, with which the leaves ſeem to the touch to abound. It is further obſervable, that that horrid and ſtrong ſmell, with which the leaves of this plant do affect our noſtrils, is very much qualified in this Inſect, and in ſome meaſure Aromatick and agreeable, and therefore we may expect, that that dreadful *Narcoſis*, ſo eminent in this plant, may likewiſe be uſefully tempered in this Inſect; which we refer to tryal. About the latter end of *May* and ſooner, you may find adhering to the upper ſide of the leaves of this plant, certain oblong Orange-coloured Eggs, which are the Eggs of this Inſect.

Note 1. that theſe Eggs yet in the belly of the Females are white, and are ſo ſomtime after they are layd; but as the young ones grow near their time of their being hatched, they acquire a deeper colour, and are hatched *Cimices*, and not in the diſguiſe of worms.

2. As to the colour, theſe riper Eggs yeild, if they be cruſhed upon white paper, they ſtain it of themſelves (without any addition of Salt) with as lively a Vermilion or *couleur de feu*, as any thing I know in nature; *Cochneil* ſcarce excepted when aſſiſted with oyl of Vitriol. Whether this be not preciſely ſo, I refer to the tryal and judgment of the Curious. I have ſent you a couple of the *Cimices* themſelves, though you ſcarce find a Henbain-plant without them. I add concerning the *Purple-husks*, whereof I gave you an account in my laſt, that I have found them ſince on Roſe-tree-twiggs alſo, and that very dark coloured ones, yeilding an exquiſit Murey: ſo that I conclude, that the Tree they may be found on, ſcarce contributes any thing to the colour or vertue of the husks, but they are the ſole work and product of the Mother-Inſect, indifferently chooſing a twig of any tree in order to the convenient placing and hiving her Eggs.

Some Obſervations concerning Glow-worms, *communicated by Mr.* John Templer *in a Letter to a friend of his in* London. *May* 31. 1671.

IN caſe you have met with any obſervations about the *Glow-worm*, I would intreat you to give me ſome account of them. I met with a Glow-worm laſt Saturday night, on which I made theſe Obſervations, upon putting her into a ſmall thin box (ſuch as pills are uſually ſent in.)

May 27.—71. Between 11 and 12 at night, I ſaw her ſhine through the Box very clearly on one ſide, the box ſhut; putting white paper into the Box, and the Worm into the paper, it ſhined through the paper and box both.

May 28. In the morning about 8 of the clock, ſhe ſeemed dead, and holding her in a very dark place, I could perceive very little light, and that only when ſhe was turned upon her back, and by conſequence put into ſome little voluntary motion, which happily the darkneſs of the place would not let me obſerve. After Sun-ſet that night, ſhe walked briskly up and down in her box, ſhining as clearly as the night before, and that when there was ſo much day-light that I could read in *Sylvius* without a Candle.

May 29. In the morning ſhe ſeemed dead again,at night recovered her ſelf, and ſhined as well as ever through the box,and opening the box, and holding a large Candle in my hand,the light of it did not ſenſibly diminiſh that of the Glow-worm.

May 30. *Hor.* 10. *veſper.* I ſet the box with the worm in it in my bed Chamber about four yards from my bed-ſide in a window,where I perceived it ſhine through the box for almoſt an hour; I then falling a ſleep, at my awaking I found it ſhining,and obſerved it in plain day-light for about ½ hour, and then wholly ceaſing. Looking immediately upon my watch it was near four a clock in the morning.

May 31. The worm ſhined pretty clearly in my Kitching, which you know a very lightſome room, at five a clock in the evening,at which time the ☉ ſhined gloriouſly into the ſame room. Give me leave to add,

1. I never ſaw her ſhine without ſome ſenſible motion either in her body or legs.

2. In her cleareſt ſhining ſhe extends her body a third part beyond its uſual length.

3. If my ſenſes fail me not, ſhe emits a ſenſible heat in her clear ſhining.

Even now looking into my box, the Glow-worm ſhined little,having contracted her body into a bending poſture, the light ſcarcely ſo big as a great pins head;upon touching of her ſhe extended her ſelf, walked in her box, and at firſt extent ſhined as gloriouſly as ever.

An Accompt of ſome Books.

I. *Of the USEFULNESS of EXPERIMENTAL NATURAL PHILOSOPHY, the Second Tome; by the Honourable* Robert Boyle Eſq; *Fellow of the* R. Society. *Oxford* 1671. *in* 4°.

THis Illuſtrious Author, in purſuance of his deſign, begun in the *Firſt Tome* of this Work (publiſhed many years ſince) which is to manifeſt, that Experimental Philoſophy is conducive to improve the Underſtanding and to increaſe the Power of Man, proceeds in this *Second Tome* to deliver Six very Inſtructive and Uſeful *Eſſays*.

The *Firſt* of which contains ſome General Conſiderations about the Means, whereby Experimental Philoſophy may become Advantagious to *Human Life*; not only by bringing improvements both to the *Trades* that miniſter to the Neceſſities of Mankind, and to thoſe that ſerve for Mans Accommodation and Delight; but alſo by introducing *New* ones, partly ſuch as are altogether *newly invented*, and partly ſuch as are *unknown* in the place, where the Naturaliſt brings them in requeſt. And not only ſo, but it ſhews further, that there is not any one Profeſſion or Condition of Men, (perhaps not any ſingle perſon of Mankind) that may not be ſome way or other advantaged or accommodated, if all the Truths diſcoverable by Natural Philoſophy, and the Applications that might be made of them, were known to the Perſons concerned in them: Intimating withall the Cauſes of Barrenneſs, that have hitherto kept Phyſicks from being conſiderably Uſeful; ſuch as are, *Many* falſe and fruitleſs Doctrines of the Schools; *the* Prejudices, by which men have been hitherto impos'd on about Subſtantial Forms, and the Eſſential difference betwixt Natural and Artificial things, &c; *a* too plauſible deſpondency; *a* want of belief that Phyſicks much concern'd Mens Intereſts; *want* of encouragement, of Curioſity, of a Method of enquiring and Experimenting; of Mathematicks and Mechanicks; of aſſociated endeavours, and the like.

The *Second* Eſſay treats of the Uſefulneſs of *Mathematicks* to Natural Philoſophy; ſhewing, that the Empire of Man may be conſiderably promoted by the *Naturaliſts* skill in *thoſe* Sciences, as well Pure as Mixt.

The *Third* proveth the Uſefulneſs of *Mechanical* Diſciplines to Natural Philoſophy, ſhewing, that the Power of man may be much increaſed by the Naturaliſts skill in *Mechanicks*; foraſmuch as Nature does play the Mechanitian, not only in Plants and Animals and their parts, but in many other curiouſly contrived Bodies.

The *Fourth* manifeſts, That the *Good* of Mankind may be much increaſed by the Naturaliſts Inſight into *Trades*: for the making out of which, the Author endeavors to ſhew two things; the *one*, that an Inſight into Trades may improve the Naturaliſts knowledge; the *other*, that the Natural Philoſopher, as well by the skill thus obtained, as by the other parts of his knowledge, may be enabled to improve Trades; and this *partly* by increaſing the number of Trades and adding New ones; *partly*, by uniting the Obſervations and Practiſes of differing Trades into one Body of *Collections*; *partly*, by ſuggeſting improvements in ſome kind or other of the particular Trades. And here we cannot but obſerve, that our Noble Author taketh particular care in the *Preamble* to this Book, very fully to anſwer the objection, clamorouſly preſſed by ſome, as if Tradeſmen were injured by diſcovering thoſe things, which are called the Myſteries of their Arts.

The *Fifth* maketh it out, That that may be done by *Phyſical* knowledge, what is wont to require *Manual* skill, or, that the knowledge of peculiar Qualities, or Uſes of Phyſical things, may enable a man to perform thoſe things Phyſically, that ſeem to require Tools and Dexterity of Hand, proper to Artificers.

The *Sixth* and laſt repreſents Mens great *Ignorance* of the Uſes of *Natural* things; or, that there is ſcarce any one thing in Nature, whereof the Uſes to humane Life are yet throughly underſtood; which is done, *both* to rouze up the Curioſity of Men by ſhewing how much it hath been defective, *and* to encourage it alſo, by ſhewing how much of Nature there remains yet undiſcover'd, to recompenſe as well as to exerciſe our Induſtry.

From the whole, the Attentive Reader will, beſides the advantages that are *common* to it with the formerly publiſht *Tome*, eaſily gather theſe *peculiar* uſes: *Firſt*, that it may afford many Materials for the Hiſtory of Nature; which that it might the more plentifully do, the Author hath purpoſely on ſeveral occaſions added a greater number of *Inſtances*, than were abſolutely neceſſary for the making out of what he intended to declare or prove. *Secondly*, it may afford ſome Inſtructions, Advices and Intimations to promote the Practical or Operative part of Natural Philoſophy in divers particulars, wherein Men have been either not able, or not ſollicitous to aſſiſt the Curious. *Thirdly*, it may enable Gentlemen and Schollars to converſe with Tradeſmen, and benefit themſelves (and perhaps the Tradeſmen too) by that Converſation; or at leaſt, it will qualify them to ask queſtions of Men that converſe with things; and ſometimes to exchange Experiments with them. *Fourthly*, it may ſerve to beget a confederacy and an Union between parts of Learning, whoſe Poſſeſſors have hitherto kept their reſpective skills ſtrangers to one another; and by that means bring great Variety of Obſervations and Experiments of differing kinds into the Notice of one man, or of the ſame perſons; a thing that may prove very advantageous towards the increaſe of knowledge. *Fifthly*, it may contribute to the reſcuing of Natural Philoſophy from that unhappy Imputation of Barrenneſs, which it hath ſo long lain under, and which hath been, and ſtill is, ſo prejudicial to it. And *Laſtly* and principally, it may ſerve by Poſitive Conſiderations and Directions, to awaken the Generality of thoſe that are any thing inquiſitive, and both loudly excite and ſomewhat aſſiſt the Curioſity of Mankind; from which alone may be expected a greater progreſs in Uſeful Learning, and conſequently greater advantages to men, than in the preſent State of Humane affairs will be eaſily imagined.

II. *Enchiridion METAPHYSICUM, ſive de REBUS INCORPOREIS Diſſertatio*, *per* H. M. Cantabrigienſem. Londini 1671. *in* 4°.

THough this Treatiſe at the firſt aſpect may ſeem not to be ſutable to make an Ingredient of theſe *Tracts*, whoſe deſign and buſineſs it is to give an account of what is tranſacting among Learned and Ingenious Men in *Phyſical, Mathematical* and *Mechanical* matters; yet, after it ſhall have been made to appear, how great a number of *Corporeal* Phænomena of the world and how many *Phyſical* Experiments are made uſe of and examined in this Book, in order to the attainment of the End propoſed by the Author, it will then, 'tis preſumed, be thought proper enough to be taken notice of in theſe Papers; it being ſo complicate with what Philoſophers look upon as the very Principles of the Effects of Nature, *Matter* and *Motion*.

The Learned Author then, worthily deſigning in this *Firſt part* to evince the *Exiſtence* of *Incorporeal* Beings, and to explain the *Nature* of them, thinks fit, for the compaſſing of that deſign, to conſider and examine divers of the chief *Phænomena* of the World, which have been by *Des-Cartes* and other noted Philoſophers refer'd to meer *Mechanical* Cauſes; and upon examination to repreſent, that they are in vain and falſely aſcribed to ſuch Principles, and that conſequently *Immaterial* Beings muſt needs be acknowledged to be the Cauſes of them. Which how ſucceſſfully it is by him perform'd, we muſt leave to Perſpicacious and Candid Readers to Judge: Our part only being to deliver here ſome of the principal Heads of this Treatiſe, and thereby to invite Judicious men to weigh the whole matter.

Paſſing by therefore that part of this Diſſertation, which is meerly Metaphyſical, we ſhall obſerve, *Firſt*, that our Author chargeth the famous *Deſ-Cartes* to have deliver'd a precarious and a very unphiloſophical definition of *Motion*, ſuch an one as is repugnant to Senſe and all the Rational faculties,and to have introduced ſuch Principles, whereby he might aſſert a *Neceſſity* of Exiſtence in Matter.

Next, he maketh it his buſineſs to demonſtrate,that there is ſome Extended immoveable, not imaginary,but real,Being, diſtinct from moveable Matter; which thing he maketh Spiritual and Immaterial, pervading the whole Univerſe and penetrating all Matter, and that which hath ever been and will be for ever (independently from our cogitation) and is ſomething Divine. Where it may be obſerved, that, whereas *Des-Cartes* will have that Space, which is called *Vacuum*, to be that Corporeal ſubſtance, called *Matter*, he (our Author) labours to ſhew, that that Space or Internal Place is really diſtinct from Matter, and an Incorporeal Spirit; affirming thereupon, that by the ſame door,by which the *Carteſian* Philoſophy ſeems to have endeavour'd to exclude God out of the World, he hath again introduced him, and attributing the ſame Titles to this Internal Place, that are aſcribed to God, and making the Exiſtence of this Space as eternal and neceſſary, as that of a Deity. See p. 63. 64. 66. 69. 71. 72.

From this Extended Immoveable Subſtance he deduceth, that all Spirit, contradiſtinct to Matter, is extended or hath an Amplitude, yet not Phyſically,though mentally, diviſible into parts; and would have us conſider this immenſe and immaterial ſpace and ſubſtance as ſome Repreſentation of the Divine Eſſence, yet with a preciſion from the Life and Operations of the ſame.

Then proceeding to the *Firſt Matter*, as 'tis in it ſelf, he defineth it to be an Homogeneal Congeries of Phyſical Monads or minute particles, that are not any more diviſible, and that are impenetrable, and uncapable to cohere and move of themſelves, though capable to be united and mov'd; whence he eſteems, that the Exiſtence of an Incorporeal ſubſtance can be ſufficiently demonſtrated, foraſmuch as thoſe minute particles cannot coaleſce nor move of themſelves.

Another argument to demonſtrate the Exiſtence of Incorporeal Beings he deduceth from the Succeſſive Duration of the World. And then paſſeth on to prove the ſame (which doubtleſs the Reader will be ſurpriſed at) from divers *Phænomena* of Nature, by him conceived not explicable by meer *Mechanical* cauſes; as from thoſe of Gravity; from ſome Experiments performed in the *Machina Boyliana*, as that of the Suckers aſcent with a great weight hung to it, and that of the firm Cohæſion of the two Marbles; as alſo from thoſe *Hydroſtatical* Experiments, concerning the Gravitation of water upon water; and concerning ponderous Bodies not ſinking at a competent depth, and the Body of a *Diver* not ſenſible of pain: To which he adds thoſe proofs, which he thinks may be taken, for the ſame purpoſe, from the Flux and Reflux of the Sea; from Magnetiſmes; from the Bigneſs and Figure of the Sun and Stars; from the immenſe Celerity of the Globuls in the upper part of the Vortex, and the Motion of Comets; from the nature of Light and Colours; from the generation of the Clouds and the roundneſs of Rain-drops, and the Rain-bow; from the Winds, Thunder and Lightning; from the Structure of Plants and Animals; from the Operations of the Soul; and from all thoſe *Phænomena* that are above and beſides Nature. After all which he giveth us his Definition of a *Spirit* in general, together with its Explication; where he undertaketh *both* to make it out, Why an extended *Spirit* is more capable of *Perception*, than extended *Matter*? *And*, to ſhew, How a Spirit, ſo ſubtile and penetrative, that it ſeems not capable of adhering to Matter, may yet be conceived able to move and impell Matter? And that the cohæſion of a Spirit with Matter is as intelligible, as the Union of one part of Matter with another.

III. *DIOPHANTI Alexandrini ARITHMETICORUM Libri ſex, & de NUMERIS MULTANGELIS Liber unus; cum Commentariis C. G.* Bacheti, *& Obſervationibus D. P. de* Fermat *Senatoris Tholoſani: Cui acceſſit* Doctrinæ Analyticæ *Inventum Novum*: Toloſæ, 1670. *in Folio.*

BEing inform'd, that there is an Able Mathematician here, that intends to publiſh in due time his conſiderations touching what is ſaid to be New in this Edition, we ſhall here only intimate, That in this Book, the Works of *Diophantus Alexandrinus* (concerning Numeral Algebra or Analyticks, and Figurate Numbers) as they were formerly publiſhed in *Greek* and *Latin* by *Gaſper Bachet,* with his Commentaries thereon, and ſome Treatiſes of his own, prefixed and ſubjoyned thereto; are now printed anew with the Annotations of that Excellent Senator of the Parliament of *Tholouze*, Monſieur *Fermat*; together with ſome New Inventions of His in Numeral Algebra, and the Solution of divers Numeral Problems, omitted by others: Collected out of his private Letters by R. P. *Jacobus de Billy* S. I. All publiſhed by Monſieur *Fermat*, P. Fil.

IV. *ROSETUM GEOMETRICUM, cum Cenſura brevi Doctrinæ* Walliſianæ *de* Motu, *Auth.* Thoma Hobbes *Malmesburienſi. Londini apud* Guil. Crook, *ad ſign. Draconis viridis* without Temple-bar. 1671. *in* 4°.

THe Author of this Tract tells his Algebriſt Reader in his *Preface* to him, that he will end the Controverſie he hath with him (if he pleaſeth) in this manner. *Firſt* he would have him inquire, Whether a *ſeries* of equal quantities, or of ſuch as encreaſe in a certain ration, as duplicat, or triplicat, *&c.* be a finit or infinit quantity. If he finds it to be *Infinit*; he would then have him inquire, Whether that can have any proportion to a *Finit* quantity. Thirdly, he would have him inquire, Whether a Line or any other Magnitude be not diviſible *in infinitum*; or, whether there can be a quantity infinitely ſmall? If he finds, that all quantity is ever diviſible, and that a *ſeries* of equal quantities, or of ſuch as do increaſe equally, or in a *duplicat* or *triplicat* ration, is an *Infinit* quantity, and holds no proportion to a *Finit*; and that there is no quantity infinitly ſmall; then he would have him grant, that the Doctrine of Dr. *Wallis* in his *Arithmetica Infinitorum*, and in his Book of *Motion* lately publiſh'd, is vain and falſe as founded on them; but if otherwiſe, he will yeild the victory.

The Book it ſelf treateth firſt of 21 *Propoſitions*, ſaid by the Author to have been attempted hitherto in vain: adding a Cenſure concerning Dr. *Wallis*'s two firſt parts *Of Motion* and *Mechanicks*, which hath ſome ſtrictures accuſing thoſe Treatiſes of Obſcurity and vitious Definitions; which how juſtly 'tis done, I leave to the Readers Judgment, or to the Anſwer that may be expected from the Perſon concerned.

V. *The* Prodromus *of a Diſſertation concerning a SOLID CONTAINED IN A SOLID, by* Nicolaus Steno. *Engliſh't out of Latin.* London 1671. *by* Moſes Pitt *in* Litle Britain, in 8°.

THe Author of this Curious and Learned *Prodromus* apprehending, that he might be diverted for a great while from finiſhing his intended main Diſſertation touching the *Frame* and *Changes* of the *Earth*, and the *Manner* of the *Productions* made therein; thought fit to deliver in this Tract both a Scheme and a Breviate of the ſame; foraſmuch as he doth not only delineate the Method, he hath therein obſerved; but alſo ſums up the moſt conſiderable particulars of his whole Deſign.

He ſaith then, that he hath divided that Diſſertation of his into *Four* parts. The *Firſt*, by way of Introduction, is to ſhew, that the Queſtion about *Marine ſubſtances*, found at a great diſtance from the Sea, is ancient, pleaſant and uſeful, and that, though the Solution thereof have been hitherto very uncertain, yet he hopeth he ſhall be able to bring it to a certainty. The *Second*, reſolveth this General Problem (whence he conceiveth that the Explication of all the difficulties about this Subject depends,) *viz. A Natural Body of a certain Figure being given, to find arguments and marks in the Body it ſelf, whereby to detect the Place and Manner of its Production*: Which Problem he affirms to have ſo reſolved, that no Sect of Philoſophers ſhall find juſt cauſe to except againſt the Principles and Notions by him ſuppoſed for its Explication. The *Third* is deſign'd to examine the Particular *Solids* included in a *Solid*, according to the Laws diſcover'd in the Reſolution of the General Problem. The *Fourth* is to repreſent, the different States or Conſtitutions of *Toſcany* (for Inſtance) and propoundeth a way of Explicating the *Phænomena* of the *General Deluge*, not contradicting the Laws of Natural Motions.

And ſo much for his deſigned *Method*. As to the *Summ* of the moſt remarkable particulars of the whole work, it may be reduced to this.

Firſt, he comprehends, what he hath to offer about his above-mentioned General Problem, in *three* Propoſitions; *One* is, that if a Solid Body be every way encompaſs'd with another Solid Body, *that* of the two was firſt hardned, which by the mutual contact expreſſeth on its ſurface the proprieties of the ſurface of the other. The *Second* is, that if a Solid Body be every way like another Solid Body, not only as to the condition of its ſurface, but alſo as to the inward frame and texture of its parts, it is alſo like to it as to the Manner and Place of its production; excepting only thoſe qualities of Place, which are often found in it, and are not any advantage or diſadvantage to the production of the Body there lodged. The *Third* is, that a Body produced according to the Laws of Nature, is produced out of a *Fluid*. Where yet he waveth the firſt Delineations in the production of Solid Bodys, but delivers ſeveral poſitions about their Increaſe.

Having thus generally conſider'd a *Solid contain'd within a Solid*, he proceeds to a Particular examination of thoſe various Solids, that are digg'd out of ſeveral parts of the Earth, as *Incruſtations*, *Sediments* or Beds, *Angular Bodies*, *Shels* of Sea-fiſhes, the ſhapes of *Cockles* and *Plants*, &c.

From the *Change* of the *Scite* of *Beds* he giveth an Account; 1. Of the Principal Origin of *Mountains*, *Hillocks* and *Valleys*, and their various Conſtitution, Matter, Shape, &c. 2. Of the Paſſages for *Springs* and *Winds* ruſhing out of Mountains, fœtid Exhalations, hot Ebullitions; as alſo of the Changes of Hot Springs into Cold, and the Turning of the Courſe of Rivers another way; of Rivers running in one place under ground, and riſing again in another; of whole Countries being ſwallow'd up with their Houſes and Trees; of great Lakes now appearing where Towns ſtood formerly, &c. 3. Of the many kinds of *variegated Stones*, as alſo of the Receptacles of *Minerals*; where do occur very good Obſervations.

In his diſcourſe about *Angular Bodies*, he delivers many conſiderable things about the Production of *Chryſtals* in the Cavities of Stones, about their firſt Concretion between two Fluids, or between a Fluid and a Solid, or *in* a Fluid; as alſo about the *Motion* of the Chryſtal in matter, whereby it is determin'd to the Planes of the all-ready form'd Chryſtal: Concluding from his Obſervations, that extream Cold is not the Efficient cauſe of Chryſtals; nor that 'tis the Aſhes alone burnt by fire that turn into Glaſs; nor the force of the Fire alone that produceth Glaſs; and that 'tis not beyond the power of Man, to diſcover a production of Glaſs without the violence of Fire: Where, by the by, he intimates what it is, whence depends the main cauſe of the difference of Chryſtal from Glaſs, both as to Refraction and other Operations.

From Chryſtals he paſſeth on to conſider the Angular Bodies of *Iron* and *Copper*; and ſheweth, how the production of them agreeth in ſome things with that of Chryſtals, and how it differs from them.

Thence he goes on to *Diamonds*, and obſerveth, how they alſo are produced in a Fluid incloſed in the Cavities of Stones, together with the variety of their Figure. Next, he diſcourſeth of *Marcaſites*, and delivers alſo ſeveral Obſervations

ſervations about the *Selenites*, and of *Talc*, and affirms in particular, that the Solid body of *Talc* may be *diſſolv'd* into a Fluid, as being *coagulated* from a Fluid, though that diſſolution cannot at all be perform'd by Fire, foraſmuch as that part of it, which is able to diſſolve it, flyes away by the torture of the Fire.

After this he proceeds to *Shells*, both taken out of the Sea, and found in Mountains; ſhewing, of what and how they are produced, and whence proceeds the variety of colours ſeen in them; and explaining particularly, how *Pearls* are produced, as well thoſe, that being faſtn'd to the Shels are not ſo very round, as thoſe which by reaſon of the obſtruction of the pores in the Animals ſurface acquire a round figure within the pores themſelves: where occur many (in my opinion) very curious and uncommon Obſervations of the Coats of Pearls and the Shels of Pearl-bearing Fiſhes, and their difference; as alſo of the cauſe of the different Colours in Pearls; making it manifeſt, that though globuls made up of various coats may be contriv'd by Art, in imitation of Nature; yet to diſpoſe their tunicles out of a ſeries of threds by an appoſition of one to another, whence depends the native ſplendor of Pearls, will be very hard to effect.

Next, he giveth an account of *Shels lying under-ground*, affirming, that they were once the parts of Animals living in Water, and proving it by the ſole inſpection and conſideration of thoſe Shels themſelves. Which done, he maketh out the particular *Phœnomena* of divers of them found in *Toſcany*. And what he hath ſaid of Shels, he affirms alſo of other parts of Animals, and of the Animals themſelves buryed in the Earth, ſuch as are the Teeth of Sea-dogs, the Back-bones of Fiſhes, various ſorts of whole Fiſhes, Skuls, Horns, Teeth, Shanks and other Bones of Terreſtrial Animals; where he informs us particularly, what to judge not only of the great number of Teeth brought away every year from *Maltha*; but alſo of the huge Thigh-bones, Skuls, Teeth, and other Bones digg'd out of the Earth.

Which done, he labours to evince by a notable Inſtance, that the production of many Shels found in theſe times is to be referr'd to the times coincident with the General Deluge. And what he hath prov'd of Animals and their parts, he extends to *Vegetables* found under-ground; ſhewing withal, what may be conceived of the *Figures* of Plants appearing on Stones.

He concludeth this *Prodromus* with a remarkable Information, ſhewing, How we may from the preſent Face of the Earth, by an attentive view, diſcover the former ſtate of it. Which he endeavours to make out by an Example taken from *Toſcany*; in the preſent Face of which he conceiveth, that the obvious Inequalities proclaim to an heedful Obſerver manifeſt arguments and ſigns of Six different Changes happen'd therein; the face of it having been, by his Obſervations, twice fluid, twice plane and dry, and twice un-even; which as he attempts to demonſtrate by an Induction of many places in *Toſcany* view'd by himſelf, ſo he confirms it of the Whole Earth by the Deſcriptions of various parts of the World made by ſeveral Authors; obviating the chief difficulties, that may occur about each Face and particular Conſtitution of the Earth.

An Advertiſement.

'TIs ſuppoſed, the Ingenious Reader will not be diſpleas'd to be inform'd, That *Vitruvius* is done into *Engliſh*; Containing the whole Body of *Architecture*, under which are comprehended the *Elements of Old Muſick*, *Picture in Freſco*, *Water-levelling* or *Hydroſtaties*; *Water-Organs* or *Hydraulics*; *Aſtronomy* and *Dialing*; *Mechanical Powers and Engins.* To which are to be added Illuſtrations by proper Cuts and Diagrams; with ſome Compariſon of Antient and Modern Architecture; and with certain other neceſſary Notes, compiled partly from the extant Comments, and partly by the help of other Able perſons.

The Cuts and Diagrams will be many and coſtly; ſo that the Learn'd Interpreter, Mr. *Chriſtoph. Waſe*, will have need of the aid of ſuch as are freely diſpos'd to encourage the Work, that the Book may come forth with the more exquiſite Ornaments within a Twelve-month. Of this deſign a fuller accompt may be had from Mr. *Benj. Tooke* Stationer, at the *Ship* in *Pauls Churchyard*.

ERRATA.

In *Numb.* 71. p. 2145. l. 18. r. *flatneſs* for *fatneſs*, p. 2146. l. 9 r. *trouble* for *troubling*, p. 2148. l. 16. r. *l.* 1 c. 28.

LONDON,
Printed for John Martyn, *Printer to the* Royal Society.

Numb. 73.

PHILOSOPHICAL TRANSACTIONS.

July, 17. 1671.

The CONTENTS.

A Table *of the Compreſſion of Air under water, from the depth of one foot to* 1947 *feet; Uſeful for thoſe, that dive for recovering of things loſt in water. More Communications of Mr.* Liſter *concerning the* Engliſh Kermes; *the Inſect it breeds; and the likeneſs it hath with the* Scarlet-kermes *in the Shops. An Extract of M.* Hevelius's *Letter concerning his further Obſervations of the* New Star *near the Beak of the Conſtellation of the* Swan. *An Accompt of the ſame Subject publiſh'd in* France; *together with ſome Communications touching the preſent total diſ-appearance of ſome Stars, that appeared formerly; taken notice of both by Signor* Caſſini *and Signor* Montanari. *An Anſwer of Dr.* Wallis *to Mr.* Hobbes's *Book, entituled* Roſetum Geometricum. *An Accompt of ſome Books:* I. *De MOTIONIBVS à GRAVITATE dependentibus, Auth.* Joh. Alphonſo Borello. II. *Diſſertationes duæ Medicæ de VENENO PESTILENTIALI, Auth.* Carolo de la Font. III. *Tractatus de CORDE, &c. cui acceſſit Diſſertatio de ORIGINE CATHARRI Auth.* Richardo Lower. IV. *Oratio de AFFECTVS EPIDEMII, A.* 1669. Leidam *depopulantis, CAVSIS NATVRALIBVS, Auth.* Franc. de le Boe Sylvio. V. *Hypotheſis PHYSICA Nova, nec non Theoria MOTVS ABSTRACTI, Auth.* Gothofredo Guil. Leibnitio *J.V.D. & Conſiliario Moguntino.* VI. *PHILOSOPHVS AVTODIDACTVS, exhibitus in Epiſtola, ex Arabica in Latinam Linguam verſa ab* Edvardo Pocockio.

A Table *ſhewing, to what degree Air is compreſſible in Sea-water, at the depth of any number of feet from* 1. *to* 33. *feet or* 5½ *fathom, and thence for any number of* 5½ *fathoms, or* 33. *feet, to* 324½ *fathoms or* 1947 *feet.*

Ome Members of the *Royal Society* did with two different ſorts of Inſtruments make divers Experiments for finding the *Proportions* of the *Compreſſion of Air under Water*, in the Month of *July*, at *Sheerneſs*, in the mouth of the River of *Medway*, at the time of high water, where the depth was then about 19 Fathom, and the proportion of the weight of the Salt-water to that of the ſame quantity of Freſh water, taken out of the river *Thames*, was as 41 to 42.

One of the Inſtruments was a Glaſs-bottle, that held a quart of water, having a bras ring faſtned to the mouth of it, with a valve or flap, that open'd inward, ſo well fitted, that the bottle being filled more or leſs with water, none dropp'd out though forcibly ſhaken. This, let down 33 foot into the water the mouth downwards, and after a little ſtay drawn up, was found to be ſo very near half full of water, at ſeveral trials, that it was thought fit to ſtate the Compreſſion of Air at that depth to that meaſure, which at other depths was found to hold the proportions ſet down in the Table.

The Quantity of the Compreſſion was known by weighing the Bottle with the water in it, after that a forcible depreſſion of the Flap had made way for the eruption of the Compreſt Air (which kept it up even when the bottle was placed with the mouth upwards,) and then filling the bottle full of the ſame water, and weighing it again; and laſtly by weighing the bottle after the water was all let forth; the weight whereof being deducted, the firſt quantity of water weighed juſt half as much as the ſecond, or ſo near it that the fraction was not conſiderable: Whence it was concluded, that the Quantity of the Air, that filled the bottle before it was immerſed in the water, was, at the depth of 33 feet, compreſt into half the ſpace it took up before, and ſo proportionably at other depths.

This was confirm'd by repeated Experiments made with the other Inſtrument; which was a Cylinder of Glaſs, ſome two foot long, cloſe at one end, and having the other end drawn ſmall with a lamp, and turn'd down a little way, after the manner expreſſed in *Fig.* 1. This Cylinder was immerſed perpendicularly with the crooked end uppermoſt; by which, as it ſunk in the water, the preſſure thereof did gradually force in ſo much water as ~~thruſt out~~ compreſs the Air proportionable to every depth, till the Cylinder was ſo far immers'd, that the hole of the crooked part of it was juſt 33 feet under water, and then it being drawn up, by meaſuring from the bottom of the Cylinder to the height of the hole in the crooked part by a pair of Compaſſes, the water was found to fill the Cylinder ſo near the half, that, the motion of the ſuperfice of the water, (which then was very ſmooth) and the minuteneſs of the difference being conſider'd, it was thought fit to ſtate it to juſt half; according to which, confirm'd by the Trials at other depths, the enſuing *Table* was computed.

The Proportion of the *Weight* of Salt-water to that of Freſh, was found by weighing ſome Ounces of both in a bottle whereof the weight was exactly known, and which was made with ſo ſmall a neck, that the addition or diminution of one ſingle drop in it was diſcernible.

The *Table* is on theſe grounds computed upon the ſuppos'd Perpendicular immerſion of a Cylinder of 60 inches, cloſe at one end, and having the open end downwards. The *firſt* Column ſhews the ſeveral depths in Feet and parts of Feet. The *ſecond*, in half Fathoms and whole Fathoms; a Fathom being ſix Engliſh feet. The *third*, the proportionable parts of Compreſſion of any Quantity of Air at the ſeveral depths in the firſt 2 Columns. The *fourth* hath theſe proportions to a Cylinder of 60 inches, expreſt in Inches and parts of Inches: which may eaſily be further calculated to any other depth deſired.

And that theſe Trials may not be thought to have been made out of meer Curioſity, they will, by conſidering and practical men, be found Uſeful for thoſe, who have occaſion to dive for recovering things loſt in water, foraſmuch as by thoſe Experiments they may afore hand know, to what depth they may, when they ſink in the *Diving Bell* or other fit Inſtruments, endure the Compreſſion of the Air for reſpiration; as alſo, how they may furniſh themſelves with Air in a fit veſſel for ſupply.

The TABLE *it ſelf.*

Depth in water.		Air Compreſt.		Depth in water.		Air Compreſt.	
In Feet.	In Fath.	to parts.	to Inches.	In Feet.	In Fath.	to parts.	to Inch.
1	0	$\frac{33}{34}$	$58\frac{4}{17}$	24	4	$\frac{33}{57}$	$34\frac{42}{57}$
2	0	$\frac{33}{35}$	$56\frac{1}{7}$	25	0	$\frac{33}{58}$	$34\frac{4}{29}$
3	$\frac{1}{2}$	$\frac{33}{36}$	55	26	0	$\frac{33}{59}$	$33\frac{31}{59}$
4	0	$\frac{33}{37}$	$53\frac{19}{37}$	27	$4\frac{1}{2}$	$\frac{33}{60}$	33
5	0	$\frac{33}{38}$	$52\frac{2}{19}$	28	0	$\frac{33}{61}$	$32\frac{28}{61}$
6	1	$\frac{33}{39}$	$50\frac{10}{13}$	29	0	$\frac{33}{62}$	$31\frac{26}{31}$
7	0	$\frac{33}{40}$	$49\frac{1}{2}$	30	5	$\frac{33}{63}$	$31\frac{3}{7}$
8	0	$\frac{33}{41}$	$48\frac{12}{41}$	31	0	$\frac{33}{64}$	$30\frac{15}{16}$
$8\frac{1}{4}$	0	$\frac{4}{5}$	48	32	0	$\frac{33}{65}$	$30\frac{30}{65}$
9	$1\frac{1}{2}$	$\frac{33}{42}$	$47\frac{\text{[illegible]}}{7}$	33	$5\frac{1}{2}$	$\frac{1}{2}$	30
10	0	$\frac{33}{43}$	$46\frac{2}{43}$	66	11	$\frac{1}{3}$	20
11	0	$\frac{33}{44}$	45	99	$16\frac{1}{2}$	$\frac{1}{4}$	15
12	2	$\frac{33}{45}$	44	132	22	$\frac{1}{5}$	12
13	0	$\frac{33}{46}$	43 [illegible]	165	$27\frac{1}{2}$	$\frac{1}{6}$	10
14	0	$\frac{33}{47}$	$42\frac{6}{47}$	198	33	$\frac{1}{7}$	$8\frac{4}{7}$
15	$2\frac{1}{2}$	$\frac{33}{48}$	$41\frac{1}{5}$	231	$38\frac{1}{2}$	$\frac{1}{8}$	$7\frac{1}{2}$
16	0	$\frac{33}{49}$	$40\frac{20}{49}$	264	44	$\frac{1}{9}$	$6\frac{4}{6}$
$16\frac{1}{2}$	0	$\frac{2}{3}$	40	297	$49\frac{1}{2}$	$\frac{1}{10}$	6
17	0	$\frac{33}{50}$	$39\frac{3}{5}$	330	55	$\frac{1}{11}$	$5\frac{8}{11}$
18	3	$\frac{33}{51}$	$38\frac{12}{51}$	363	$60\frac{1}{2}$	$\frac{1}{12}$	5
19	0	$\frac{33}{52}$	$38\frac{1}{13}$	396	66	$\frac{1}{13}$	$4\frac{8}{13}$
20	0	$\frac{33}{53}$	37 [illegible]	429	$71\frac{1}{2}$	$\frac{1}{14}$	$4\frac{2}{7}$
21	$3\frac{1}{2}$	$\frac{33}{54}$	$36\frac{2}{3}$	462	77	$\frac{1}{15}$	4
22	0	$\frac{33}{55}$	36	495	$82\frac{1}{2}$	$\frac{1}{16}$	$3\frac{3}{4}$
23	0	$\frac{33}{56}$	35 [illegible]	528	88	$\frac{1}{17}$	$3\frac{9}{17}$

Depth in water.		Air Compreſt.	
In Feet.	In Fath.	to parts.	Inch.
561	$93\frac{1}{2}$	$\frac{1}{18}$	$3\frac{1}{3}$
594	99	$\frac{1}{19}$	$3\frac{3}{19}$
627	$104\frac{1}{2}$	$\frac{1}{20}$	3
660	110	$\frac{1}{21}$	$2\frac{6}{7}$
693	$115\frac{1}{2}$	$\frac{1}{22}$	$2\frac{8}{11}$
726	121	$\frac{1}{23}$	$2\frac{14}{23}$
759	$126\frac{1}{2}$	$\frac{1}{24}$	$2\frac{1}{2}$
792	132	$\frac{1}{25}$	$2\frac{2}{5}$
825	$137\frac{1}{2}$	$\frac{1}{26}$	$2\frac{4}{13}$
858	143	$\frac{1}{27}$	$2\frac{2}{9}$
891	$148\frac{1}{2}$	$\frac{1}{28}$	$2\frac{1}{7}$
924	154	$\frac{1}{29}$	$2\frac{2}{29}$
957	$159\frac{1}{2}$	$\frac{1}{30}$	2
990	165	$\frac{1}{31}$	$1\frac{29}{31}$
1023	$170\frac{1}{2}$	$\frac{1}{32}$	$1\frac{9}{16}$
1056	176	$\frac{1}{33}$	$1\frac{9}{11}$
1089	$181\frac{1}{2}$	$\frac{1}{34}$	$1\frac{13}{17}$
1122	187	$\frac{1}{35}$	$1\frac{5}{7}$
1155	$192\frac{1}{2}$	$\frac{1}{36}$	$1\frac{2}{3}$
1188	198	$\frac{1}{37}$	$1\frac{23}{3\text{[illegible]}}$
1221	$203\frac{1}{2}$	$\frac{1}{38}$	$1\frac{\text{[illegible]}}{\text{[illegible]}9}$
1254	209	$\frac{1}{39}$	$1\frac{7}{13}$
1287	$214\frac{1}{2}$	$\frac{1}{40}$	$1\frac{1}{2}$
1320	220	$\frac{1}{41}$	$1\frac{19}{41}$

Depth in water.		Air Compreſt.	
In Feet.	In Fath.	to parts.	Inches.
1353	$225\frac{1}{2}$	$\frac{1}{42}$	$1\frac{3}{7}$
1386	231	$\frac{1}{43}$	$1\frac{17}{43}$
1419	$236\frac{1}{2}$	$\frac{1}{44}$	$1\frac{4}{11}$
1452	242	$\frac{1}{45}$	$1\frac{1}{3}$
1485	$247\frac{1}{2}$	$\frac{1}{46}$	$1\frac{7}{23}$
1518	253	$\frac{1}{47}$	$1\frac{13}{47}$
1551	$258\frac{1}{2}$	$\frac{1}{48}$	$1\frac{1}{4}$
1584	264	$\frac{1}{49}$	$1\frac{11}{49}$
1617	$269\frac{1}{2}$	$\frac{1}{50}$	$1\frac{1}{5}$
1650	275	$\frac{1}{51}$	$1\frac{9}{51}$
1683	$280\frac{1}{2}$	$\frac{1}{52}$	$1\frac{2}{13}$
1716	286	$\frac{1}{53}$	$1\frac{7}{53}$
1749	$291\frac{1}{2}$	$\frac{1}{54}$	$1\frac{1}{9}$
1782	297	$\frac{1}{55}$	$1\frac{1}{11}$
1815	$302\frac{1}{2}$	$\frac{1}{56}$	$1\frac{1}{14}$
1848	308	$\frac{1}{57}$	$1\frac{1}{19}$
1881	$313\frac{1}{2}$	$\frac{1}{58}$	$1\frac{1}{29}$
1914	319	$\frac{1}{59}$	$1\frac{1}{59}$
1947	$324\frac{1}{2}$	$\frac{1}{60}$	1

Extracts of two Letters from Mr, Martin Liſter *to the Publiſher, of* June 14. 1671. *and* July 5. 1671. *concerning the kind of Inſect, hatched of the Engliſh* Kermes, *formerly taken notice of and deſcribed by the ſame in* Numb. 71. p. 2164; *as alſo the Uſe of theſe Purple Inſect-Husks for tinging, together with a compariſon made of this* Engliſh Purple-Kermes *with the* Scarlet-Kermes *of the Shops.*

THe *firſt* Letter, *June* 10th. I found ſeveral of the *Patellæ Kermi formes* hatched in a Box, where I had purpoſely put them. They prove a ſort, as I gueſſed by the figure of the Worm, of Bees, but certainly the leaſt, that I ever yet ſaw of that Tribe, as not much exceeding in their whole bulk the half of a Piſmire. They are very compact and thick for the bigneſs; of a cole-black colour. They ſeem to want neither ſtings, nor the three balls in a triangle in their fore-head; which yet are things to be referred to the teſtimony of a Microſcope. That which is very remarkable to the naked Eye, is a white or ſtraw-colour large and round ſpot on the back: Of their four Wings the upper pair are ſhaded or dark-ſpotted, the undermoſt pair are clear. We may entitle them, according to our cuſtom, *Apiculæ nigræ, maculâ ſuper humeros ſub-flaveſcente inſignitæ, è patellis ſive favis membranaceis, veri Kermes ſimilibus, ſuâque itidem purpurâ tingentibus, Ceraſi aut Roſæ aliarumve arborum virgis adtextis, excluſæ.*

This of the Purple-Husks, and the other Hiſtory of Scarlet-ſtaining Eggs * I preſent you as parallels of our Engliſh ſtore to *Kermes* and *Cocheneil*; I mean, additaments to encreaſe the number of agreeable tinging Materials and not Medicaments, unleſs wary and ſafe Tryal ſhall diſcover to us if they have any Medicinal qualities, as uſe and cuſtom hath made us believe the Exotic have in an high degree. One of the ſaid husks, I ſent you, adhered to a Roſe-tree-twig, and the other to a Cherry-tree. But a Roſe-buſh ſince hath afforded me ſome ſcores of theſe *patellæ*, many of which are hatched in the box I put them. It is to be further obſerved, 1. that thoſe that look the blackeſt, yield the deepeſt and beſt purple: 2. That as the Bees come to maturity, the dye ſeems to be ſpent, and the Husks grow dry. 3. That the

*Of which latter, See *Numb.* 72. *p.* 2176. 2177.

the young ones make their way out at ſeveral ſmall holes; whereas the true *Kermes*-husk ſeems to be pierced but in one place.

The *Second*; The diſcovery of our *Engliſh Kermes* hath very much pleaſed ſome of the Curious in theſe parts; who reſolve upon Tryals of it the next ſeaſon. I think, I advertiſed you formerly, that that deep purple or violet, with which the inſides of the husks are lin'd, is much ſpent, if the husks be not taken whileſt the Bees are in *vermiculo*; and the blackeſt husks are richeſt in colour. Yeſterday in very good company we compar'd our Engliſh *Purple-kermes* with the *Scarlet-kermes* or Grains of the Shops, and found them in every point to agree ſave in the colour of their Juices; and particularly (finding in ſome parcels of the Shops many yet ſticking to little twigs of the *Ilex*,) we confidently affirm, that thoſe as well as ours are only contiguous to the Ilex-branches, and are not *excreſcencies* of the Tree, much leſs *fruit* or *berries*; by which abuſive names they have been too long known; But that they are the artifice and ſole work of the mother-Bee in order to the more convenient hiving and nouriſhment of her young.

An Extract of a Letter, written to the Publiſher by the Excellent Johannes Hevelius, *concerning his further Obſervations of the* New Star *near the* Beak *of the* Swan; *to be compared with what was formerly publiſhed of the ſame Argument in* Numb. 65. *and* Numb. 66.

This Extract we ſhall give you in the ſame Language it was written from *Dantzick* the 1ſt of *May* 1671. ſt. n.

—D*E reliquo mearum etiam partium eſſe duxi, Vobis quantocyus ſignificare, me nudius-tertius, die videl.* 29. April. *Novam illam Stellam ſub capite* Cygni, *ad Viam Lacteam, quam Anno proximè præterito à menſe* Junio & Julio, *ad uſque* 14. Octob. *conſpexeram, denuo obſervaſſe, & quidem eo ipſo loco, quo tunc temporis conſiſtebat. Interim magnitudine mihi nunc aliquanto major apparet; quippe excedit illam in Roſtro Cygni, nec non eam quæ eſt in ancone inferioris alæ Cygni, feréque illi quæ eſt in Pectore Cygni æquatur, niſi quod lumine paulò obtuſiori & rubicundiori modò luceat. Quâ verò die primùm rurſus illuxerit, affirmare adeò certò non poſſum. Nam*

cùm ferè in ea fuerim opinione, illam vel nunquam, ut plernmque factum fuit, vel tam cito non redituram, ad locum illum haud ſæpius oculos direxi; nec fieri id quidem poterat, cùm hac hyeme, nocturno tempore, circa & infra Horizontem Caput Cygni perpetuo hæſerit. Certus interim ſum, ad menſem Decemb. Januar. *imo* Februarii *haud conſpicuam fuiſſe. Etenim poſt* 14. Octobris, *quo videri deſiit, memini me eam ſæpius quæſiviſſe eo in loco, ſed nuſquam apparuiſſe. Idcirco, quantum colligere datur, vix ante initium* Martij, *quin, ſine dubio, adhuc tardius iterum prodiit. Pridie eam à reliquis quibuſdam* Fixis *ſum dimenſus. Diſtat à Cauda* Cygni, 20 *gr.* 55'. 20"; *ab ancone Alæ ſuperioris Cygni,* 17 *gr.* 47'. 50"; *à Capite vero* Serpentarii, 34 *gr.* 19'. 40"; *ſic ut eodem planè loco adhuc perſiſtat, ubi antea fuerat.*

De reliquo, mihi perſuadeo, cùm ſemel, & quidem intra adeò breve temporis ſpatium redierit, illam ſæpius fore inviſibilem, rurſuſq; conſpicuam, cum incremento & decremento, illius, quæ in Collo Ceti *eſt, adinſtar. Proinde operæpretium fuerit, cùm Philoſophiæ plurimum interſit ſcire, An dentur evidentes ejuſmodi alterationes in Cælo plures, ut diligentius impoſterum ad eam attendamus; poſſitne certa quædam Hypotheſis de ejus occaſu & ortu, decremento item & incremento, à nobis excogitari? Et an ſingulis annis, ut Stella in* Collo Ceti, *ſub aſpectum veniat? An certo anni & omni tempore ſub aſpectum veniat, pari ratione; an vero cum retardatione vel anticipatione aliqua certa? Et denique, an ſemper æquali magnitudine, ſimili colore & lumine prodeat, permaneatque? Ego, dante Deo, meam operam hac in parte polliceor; reliqui Vraniæ cultores quin idem facturi ſint, nullus dubito.*

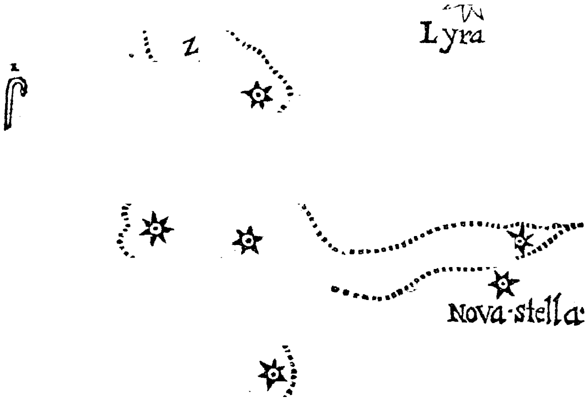
Another Accompt of the ſame Subject, Engliſhed out of the French Journal des Scavans, *printed at* Paris *the* 22th *of* June 1671.

THe *New Star*, which *Don Anthelme*, a *Carthuſian* of *Dyon*, hath lately diſcover'd *, is one of the rareſt Appearances obſerved this good while. As this perſon contemplated the Heavens at night, *June* 20th of the laſt year, deſirous to diſcover that admirable Star, which hath appear'd and diſappear'd twice ſince the beginning of this Century in the Conſtellation of

---

* See Numb. 65. p. 2092. *Where the time mentioned of the firſt diſcovery of this Star, differs from that of the relation of this* Journal, *and is doubtleſs hence to be corrected.*

the *Swan* *; he perceived near the ſame Conſtellation a Star of the *Third Magnitude*, which he had never yet obſerved. He preſently ſignified it to the Company which aſſembleth in the Library of the King: And divers of that Aſſembly having beheld the Heavens about the end of *June* and the beginning of *July*, took notice, that there was indeed about the *Beak* of the *Swan* a *New Star* of the *third magnitude*, not to be met with in any Catalogue of Aſtronomers, although many other neighbouring Stars, that are much ſmaller, be exactly marked by them. It was ſcituate as appears in the following figure*. *See Fig. 2.



The Obliquity of the *Ecliptick* ſuppoſed to be 23½ degrees, the *Longitude* of this Star, according to the Obſervation of Mr. *Picard*, was ——————————— 1°. 55'. of *Aquarius*.

The *right Aſcenſion* ——————— 293. 33.
The *Boreal Latitude* ——————— 47. 28.
And the *Declination* ——————— 26. 33.
It came to the *Meridian* after the Star *in* the Beak of the *Swan* ——————— 16'.44".
And before the *lucid* Star of the *Eagle* ——— 0. 27.
It was diſtant from the great Star of the Conſtellation of *Lyra* ——————— 18°.39.40.
From the *Beak* of the *Swan* ——————— 3. 47. 30.
And from the *Tail* of the *Swan* ——————— 20. 54. 30.

* Which is that in Pectore Cygni.

But that which is further remarkable, is, that in the beginning of *July* * this Star was obſerved to decreaſe. In the night of *July* 3d, it appear'd yet of the *Third magnitude*, but her Light was ſenſibly fainter. In the night of the 11*th* of the ſame month, ſhe ſcarce appear'd of the *Fourth magnitude*. In the night of *Auguſt* 10*th*, ſhe was but of the *Fifth*. And ſhe hath ever ſince decreaſed ſtill, ſo that at laſt ſhe became ſo ſmall that ſhe was ſeen no more.

And ſo ſhe hath remained for ſix months without ſhewing her ſelf, and we could not diſcover her again till the night of *March* 17*th* laſt, when *Don Anthelme* ſpied her in the very ſame place, where ſhe was the year before, and found, that ſhe was of the *Fourth magnitude*.

The Aſſembly that meets in the Kings Library, having notice thereof, ſeveral of them did obſerve this Star in the night of the 2*d* of *April* laſt, finding her in the ſelf ſame place where they had ſeen her the precedent year. The 3*d* of the ſame month M. *Caſſini* found her greater than the two Stars of the *Third magnitude* that are below in the Conſtellation of *Lyra*, but a little ſmaller than that in the Beak of *Cygnus*.

The 4*th* of the ſame month, ſhe appear'd to him almoſt as great and much more radiant than that of the Beak of the *Swan*.

The 9*th* of the ſame, he found her a little diminiſh't; and almoſt equal to the greateſt of the two Stars that are below in *Lyra*.

The 12*th*, ſhe was equal to the leaſt of theſe two Stars.

The 15*th*, he perceived that ſhe encreaſed, and he found her equal, the ſecond time, to the greateſt of theſe two Stars.

From the 16*th* unto the 27*th*, ſhe appear'd of different magnitudes, being ſometimes equal to the biggeſt of theſe two Stars, ſometimes equal to the leaſt, and now and then between both.

But the 27*th* and 28*th*, ſhe was become as big as the Star in the *Swan's beak*: The 30*th*, ſhe appear'd a little clearer. And the firſt ſix days in *May*, ſhe was greater.

The 15*th* of *May* ſhe was ſeen ſmaller than the ſame Star. The 16*th*, ſhe was in bigneſs between the two Stars that are below in *Lyra*: And ever ſince ſhe hath ſtill diminiſhed.

Thus this Star hath been twice in her greateſt ſplendour, firſt on the 4*th* of *April*; and the ſecond time, in the beginning of *May*: Which we read not to have ever happen'd to any other Star.

As far as can be judged from the few Obſervations made of this Star, 'tis likely ſhe is returning about *Ten* months unto the ſame appearance; whereas that in the *Whale's Neck* maketh its revolution in *Eleven* months. As for the Star in the *Swans Breaſt*, we have as yet no certain knowledge of the period of her revolution; yet

* *Compare* Numb. 66. *p.*2028.

yet one may aſſure, that ſhe taketh no leſs than *Fourteen years* to finiſh it.

The Diſcoveries,that have been made in the Heavens this laſt age, do evince,that Changes are not ſo rare there,as formerly was believed. If that was true,what *Pliny* ſaith,that *Hipparchus*, on the occaſion of a New Star he perceived, made an Enumeration of all thoſe which appear'd at that time, there would not be any one Conſtellation, in which ſome change were not found ſince that time, in regard there are few,wherein there be not found more Stars now than that Aſtronomer hath noted in them.

But as the little aſſurance we have of the exactneſs of *Hipparchus* his Catalogue giveth us cauſe to believe,that many Stars, which were not in that Catalogue, were yet in the Heavens; ſo we may well grant, that ſome of thoſe, that have been obſerved ſince, have not appear'd always. For,not to ſpeak of the Stars,that have been ſeen in the Conſtellation of *Caſſiopea*, in the Neck of the *Whale*, in the Breaſt of the *Swan*, and in *Serpentarius*; Monſieur *Caſſini* hath diſcover'd many other little ones *, which may very well be preſumed to be New. For example, he hath obſerv'd one of the *Fourth magnitude*, and two of the *Fifth* in *Caſſiopea*, where 'tis certain they were not ſeen before, many Aſtronomers having exactly reckon'd up the very ſmalleſt Stars of that Conſtellation,and yet not one of them mention'd thoſe three. He hath diſcover'd Two others, towards the Beginning of the Conſtellation of *Eridanus*,where we were ſure they were not yet about the end of the Year 1664, conſidering that this place of the Heavens, vvhere paſſed the then appearing Comet, was diligently beheld by many, who perceived divers other ſmall Stars,without obſerving thoſe two. The ſame hath alſo obſerved, towards the Arctick Pole Four of the Fifth or Sixth magnitude,which Aſtronomers, that always have their Eyes upon that place, vvould not have failed to note, if they had there appear'd before.

* *Compare thoſe,diſcover'd by M.* Hevelius, *in* Numb. *65 p.*2091.

Nor are we to wonder at it, that we ſee now more Stars in the Heavens than there appear'd formerly, ſeeing there appear'd thoſe formerly, vvhich are ſeen no more novv. For M. *Caſſini* hath obſerv'd, *that* the Star, vvhich *Bayerus* puts near that vvhich he marketh in the Figure of *Urſa minor*,appears no more; *that* that, which is marked A in the Figure of *Andromeda*, is alſo diſappear'd; *that* in lieu of that, vvhich is marked *v*, at the knee of the ſame figure, there are two others more Nordward; and *that* that,vvhich is noted ξ, is very much diminiſht, The Star, vvhich *Tycho* placeth at the extremity of *Andromeda's Chain*, and calls it of the *Fourth magnitude*, is novv ſo ſmall that one can ſcarce ſee it: And that vvhich is in his Catalogue the 20*th* of the Conſtellation of *Piſces*, is novv no more ſeen; unleſs you will ſay, that it is gone down lower than *four* degrees, to the place marked *o* in the Figure of *Bayerus* *.

But vve are not therefore preſently to ſay, that the Stars, that have been lately diſcover'd, *were* not in the Heavens before, although they vvere not ſeen there. For, as vve now knovv, that there are Stars, vvhich appear and diſappear from time to time, ſo we have cauſe to ſuſpect, that moſt of the Stars, that vvere not ſeen formerly, or that are ſeen no more novv, or are found diminiſh't, are of the ſame nature vvith the Star in the *Whal's Neck*, and do not ceaſe to be in the Heavens, though they there appear not.

It is alſo poſſible, that theſe New Stars not only vvere in the Heavens, but even appear'd there before they vvere taken notice of as Nevv ones: And it is very probable, that 'tis alſo vvith moſt Stars, as vvith that in the Neck of the Whale, vvhich vvas not obſerved at firſt, but vvhen it vvas already of the *third* magnitude; although it hath been ſince found, that it is not really ſo great vvhen it begins to appear, but that, being very ſmall in the beginning, it encreaſeth inſenſibly untill it come to that greatneſs.

However, theſe Phenomena deſerve always to be carefully obſerved by all Aſtronomers.

---

* We cannot omit taking notice here of what was communicated to the *R. Society*, about the ſame ſubject, in a Letter of *April* 30. 1670. by Signor *Montanari*, the Learn'd Profeſſor of the Mathematicks in *Bononia*, in theſe words: *Multa poſſem certè nova de Cælo Vobis tradere, quæ à multis annis obſervo, atque* Firmamento *meo* Inſtabili *exornando ac propediem evulgando ſuppeditavero; Sed unum, quod cæteris admirabilius eſt, proferam. Deſunt in Cælo duæ Stellæ* Secundæ Magnitudinis *in* Puppi Navis *ejuſque Tranſtris*, Bayero β & γ, *prope* Canem majorem, *à me & aliis, occaſione præſertim Cometæ A.* 1664. *obſervatæ & recognitæ. Earum Diſparitionem cui Anno debeam, non novi; hoc indubium, quod à die* 10. April. 1668. *ne veſtigium quidem illarum adeſſe amplius obſervo; cæteris circa eas, etiam quartæ & quintæ magnitudinis, immotis. Plura de aliarum ſtellarum mutationibus, pluſquam centenis, at non tanti ponderis annotavi*, &c.

An Anſwer of Dr. *Wallis* to Mr. *Hobbes's Roſetum Geometricum* in a Letter to a friend in *London*, dated *July* 16. 1671.

Clariſſime vir,

P*Erlegi* Hobbij *ſive* Roſetum, *ſive* Fimetum, (*nam utrumque olet*;) *in quo antiquum obtinet: Mirumque eſt, ut nec ſibi in animum inducere poſſit, nec ab amicis ſuaderi, ne ſic delirando perſiſtat ſe contemptui exponere. Notata quædam hîc tibi mitto: non quaſi metuerim, te talibus ratiociniis ſeduci poſſe, ſed ut tu, aliique, quibuſcum hæc forte communicaveris, ſine anxiâ conſideratione denuò inſtituendâ, ſtatim videatis ubi potiſſimum peccatur.*

Primæ Propoſitionis, *ſive Problematis, conſtructio* (*ut ut in re facili*) *falſa eſt.* Rectam extremâ & mediâ ratione ſecare; *docuerat* Euclides, *& demonſtraverat*, prop 30. El. 6. (*cui & alii hactenus conſenſerunt.*) *Secundum quem, poſitâ rectâ ſecandâ* 1R, *erit majus ſegmentum* $\frac{\sqrt{5}-1}{2}$R; *adeoque ſegmentum*

ſegmentum reliquum $\frac{3-\sqrt{5}}{2}\mathrm{R}$, *quod in t*[illegible]*am* 1 R *ductum, efficit* $\frac{3-\sqrt{5}}{2}\mathrm{R}^2$, *quod eſt ipſum majoris quadratum.* Hobbius *autem hîc novam proponit conſtructionem; ſecundum quam (ad calculum redactam) ſegmentum majus erit* $\frac{\sqrt{u}\,5-2\sqrt{3}:}{2}\mathrm{R}$. *Nam, poſitâ ſecandâ rectâ, ſeu quadrantis Radio,* $DA=1\mathrm{R}$, *adeoque* $DH=\frac{1}{2}\mathrm{R}$, *erit* $HX=\sqrt{\frac{3}{4}\mathrm{R}^2}=\frac{1}{2}\mathrm{R}\sqrt{3}$, *&* $IX=\sqrt{\frac{3}{4}\mathrm{R}^2}-\frac{1}{2}\mathrm{R}$, *cujus quadratum* $\mathrm{R}^2-\mathrm{R}^2\sqrt{\frac{3}{4}}$, *& (propter quadratum* $EI=\frac{1}{4}\mathrm{R}^2$*) quadratum* $EX=\frac{5}{4}\mathrm{R}^2-\mathrm{R}^2\sqrt{\frac{3}{4}}$, *hoc eſt* $\frac{5-2\sqrt{3}}{4}\mathrm{R}^2$: *ergo ipſa* $EX=\frac{\sqrt{:5-2\sqrt{3}:}}{2}\mathrm{R}$, *ſegmentum majus (ſi* Hobbio *credas) ſecandæ* $DA=1\mathrm{R}$; *adeoque ſegmentum minus,* $1\mathrm{R}\,\frac{\sqrt{:-2\sqrt{3}:}}{2}\mathrm{R}$. *Num verò* Euclidi *(atque, poſt illum, aliis hactenus) an* Hobbio *credendum ſit, tuum eſto judicium. Sin neutrius authoritati credendum putes, ſed rationi; examinemus (ut jam* Euclidis,*) ſic* Hobbii *conſtructionem. Rectam extremâ & mediâ ratione ſecare, eſt ita ſecare, ut quadratum ſegmenti majoris æquetur rectangulo ex minori ſegmento & tota ſecanda. (Quod nôrunt omnes, nec* Hobbius *diffitetur.) Sed factum ex tota* 1 R *& minori ſegmento* $1\mathrm{R}-\frac{\sqrt{:5-2\sqrt{3}:}}{2}\mathrm{R}$, *eſt* $\mathrm{R}^2-\frac{\sqrt{:5-2\sqrt{3}:}}{2}\mathrm{R}2$; *quod æquale eſſet majoris* EX *quadrato, ſed non eſt; quippe hoc jam inventum eſt* $\frac{5-2\sqrt{3}}{4}\mathrm{R}^2$. *Falſa igitur eſt* Hobbii *conſtructio. Et (propter hanc falſam) ruunt etiam quæ annectit* Corollarium *&* Confectarium.

Menda in ipſius quâ *conſtructione,* quâ *(prætenſa) demonſtratione, præter minora multa, ſunt hæc ſaltem tria grandia.* 1. *In Conſtructione, pro* Deſcribatur centro *D* quadrans *DAC* ſecans *FE* & *GH* in *K* & *X*; *dici non minus potuiſſet,* ſumatur *X* ubivis in *IG* rectâ: *Nam & ſic non minùs procederet;* Ducatur denique *EX*, *(& quæ ſequuntur omnia,) ne unâ quidem vel voce vel ſyllabâ mutatâ. Vel etiam,* ubivis in *IG* rectâ, utcunque in utramvis partem productâ: *Nam etiam hoc poſito, ſi* pag. 2. lin. 17. *pro* ſecans *AE*, *ponatur* ſecans *AE* ſaltem productam, *omnia ſimiliter procedent. (Quod legenti ſtatim patebit:) ut poſſit eſſe, per ipſius demonſtrationem, ſegmentum majus quantumvis longum.* 2. *In Demonſtratione: Cum oſtenderat* pag. 2. lin. 18, 19. duos rectos *mXI*, *IXl*, æquales quinque angulis *mXF*, *FXy*, *yXz*, *zXE*, *EXl*, *(ne inſinuato quidem, nedum probato, hos omnes eſſe inter ſe æquales:) Hinc probatum it (quaſi jam probaſſet, omnes illos quinque invicem æquales eſſe,)* angulos *zEX*, *zXE*, eſſe invicem æquales, *quia,* ſi ſecus, duo illi recti non ſic dividerentur Quinquifariam, *ſeu in quinque partes* invicem æquales, (pag. 3. lin. 4, 5.) *de quo in præcedentibus nihil dictum eſt. Sunt quidem tres, mXF, yXz, EXl, invicem æquales; item duo, FXy, zXE, invicem æquales: ſed utrumvis horum utrivis illorum æqualem eſſe, neque demonſtratum eſt, neque verum.* 3. *Ubi, ex eo quod* anguli *yXz*, *Xyr*, ſint æquales; item *yXr*, *yrX*, æquales; & *yXz*, *zEX*, æquales; *infert* (pag. 2. lin. 17, 18.) Quare anguli *X* & *E* trianguli *zEX* ſunt æquales: *Nulla eſt conſequentiæ vis: quod attendenti patebit.*

Præter hæc omnia; Propoſitionis ſecundæ *conſtructio, hanc* primæ *refutat. Nam, ſi ponamus illic totam* AG *vel* $CE=1\mathrm{R}$, *ſegmentum majus* AB *vel* AC *vel* EF *erit* $=\frac{\sqrt{5}-1}{2}\mathrm{R}$. *Nam ut* $AG=CE$ *ad* $CA=AB$, *ſic* CA *ad* CF. *Eſt autem* CA *ad* CF *ut* 2 *ad* $\sqrt{5}-1$, *(quod vult* Euclides:*) non, ut* 2 *ad* $\sqrt{:5-2\sqrt{3}:}$ *quod vult* Hobbii prop. 1. *Tam turpiter autem titubâſſe* Hobbium *in ipſo limine, eò magis mirandum eſt, & minus condonandum, quòd problematis conſtructio vera (& facilis) in ipſis elementis extet* (pr. 30. El. 6.) *éſtque pueris nota.*

Propoſitia Tertia (*multimembris*) de Polygonis Regularibus (*cum* Conſectariis *ſuis*) *dependet tota ex hac conſequentiâ*, Quoniam chordæ Cb, bc, ad chordas Ci, ic, (*in eodem circulo*) ſunt ut 8 ad 7; propterea etiam arcus $Cc=Cb+bc$ ad arcum $CE=Ci+iE$ ut 8 ad 7 (pag. 11. lin. 2.) *atque in aliis proportionibus ſimiliter*, p. 13. l. 23, 26. p. 14. l. 20, 24. p. 15. l. 4. &c. *Quaſi quidem, in eodem circulo, Arcus eſſent chordis proportionales. Quod quàm ridiculum ſit, non dictu opus eſt. Hinc infert*, EH (*ſubtenſam Octantis*) *ad* EF (*ſubtenſam Sextantis*) *eſſe ut* 3 *ad* 4, (*quia Arcus ſunt in eâ ratione*,) p. 30. l. 23. *Item*, EF (*ſubtenſam partis Duodecimæ*) *ad* EH (*partis decimæ ſubtenſam*) *ut* 5 *ad* 6 (*in ratione arcuum*) p. 14. l. 19, &c. *Satis crudé.*

Prop. Quarta; *poſtquam* Circuli peripheriam curvam eſſe *oſtenditur*, curvedinémque à flexione oriri *dicitur*, curvedinúmque aliam aliâ majorem: *Oſtenſum it, primò, quòd* quam rationem habet, in eodem circulo, angulus in circumferentia (*major*) ad angulum in circumferentiâ (*minorem*,) eandem habet curvedo majoris arcûs ad curvedinem minoris. (*Putà, curvedo arcûs quadrantalis ad ſemiquadrantalis curvedinem, ut* 2 *ad* 1, *propter duplo plures in illo quàm in hoc flexiones.*) *Deinde, quod*, In diverſis circulis curvedo majoris perimetri minor eſt curvedine minoris. *Quaſi quidem non tot eſſent in majori perimetro quot in minori Flexiones. Quod abſurdum eſt. Ut ut enim in arcubus longitudine æqualibus parciores eſſent in majori circulo quàm in minori flexiones* (*eò quod ille minorem angulum ſubtendat:*) *certè in totâ perimetro majore* (*aut etiam partibus proportionalibus, ut quæ æquales angulos ſubtendunt,*) *non pauciores erunt flexiones quàm in minore. Quique totam circuli circa Terram maximi curvedinem ſimul conſpiciat, vel hujus partem aliquotam; non minus curvedinis cernet quàm in Annulo, hujuſve parte proportionali. Hæc itaque cum præcedentibus non ſatis cohærent. Sin dicat, ſe alio ſenſu hîc, alio illic, majoritatem curvedinis intelligere; Æquivocè loquitur.*

Propoſitio Quinta, (*quæ exhibet rationem Radii ad Perimetrum circuli, ut* R *ad* $10R\sqrt{\frac{2}{5}}$; *hoc eſt, ut* 10000 *ad pluſquam* 63245, *quam alii faciunt ut* 10000 *ad minus quàm* 62832;) *dependet ex hac conſequentiâ* (p. 18. l. 5.) Quoniam ut DC ad DR (*radius ad radium*) ſic arcus CA ad arcum RS (*ſimilem*;) ita quadrantalis arcus deſcriptus radio DC, id eſt, arcus CA, ad arcum deſcriptum (*radio* DR, *hoc eſt, arcum* RS, *ſic dicendum erat; ſed ille*) radio RS extenſo in rectitudinem. *Quod abſurdè dictum eſſe, per ſe liquet.*

Propoſitio Sexta, *cum ejuſdem* Scholio & Conſectario; *Item* Propoſitio Septima, *cum ejus* Corollario & Conſectariis *quatuor*; *Item* Propoſitio Octava *quæque hac nituntur; dependent à* prop. 5. (*ut patet*, pag. 20. lin. 4, 6, 8, 10. p. 21. l. 6. p. 22. l. 5. p. 23. l. 8, 14, 28. p. 24. l. 2. p. 25. l. 1, 14, 16. p. 26. l. 18. p. 27. l. 5, 17. p. 28. l. 4.

p. 30. l. 21, 22. *nec diffitebitur* Hobbius:) *Ergo, cum illâ ruunt.*

Propoſitio Nona (*de ſectione anguli in ratione datâ*) *eodem miſero tibicine fulcitur cum* prop. 3. *nempe, in eodem circulo* Chordas Arcubus proportionales eſſe: *Adeóque juxta cum illâ cadit.*

Propoſitionis Decimæ *Corollarium verum eſt, ſi ſumatur P in producta Db; non autem, ſi in productâ AK. Cùm verò hæc duo P habeat* Hobbius *pro eodem, hallucinatur. Non enim coeunt AK, Db, in eodem rectæ BC puncto P; ut poſt dicetur.*

Propoſitio Undecima *falſa eſt; nempe* Tangentes grad. 30 & grad. $22\frac{1}{2}$ ſimul æquari Radio. *Hoc eſt (per Canonem Tangentium) in numeris abſolutis quàm proximè* $5773503+4142136=10000000$: *vel (accuratè) in ſurdis* $\frac{1}{3}\sqrt{3}, +\sqrt{2}-1, =1$. (*ſatis abſurdè.*) *Nec probat ille (quod in demonſtratione aſſumitur,)* rectas *AK, Db*, productas incidere in (*Rectæ BC*) punctum *P. Poteſt utique punctum concurſûs (non obſtante probatione ſuâ) vel ſupra vel infra rectam BC contingere. Quod enim in probationem adducit,* pag. 37. lin. 21. Cum enim &c. *non ſequitur. Ut ut enim angulus quem faciunt (productæ) AK, Db, ſit* $\frac{7}{12}$ *unius recti; & quem cum BC facit (producta) AK,* $\frac{8}{12}$; *& quem cum eâdem BC facit (producta) Db,* $\frac{9}{12}$ *unius recti; non tamen hinc magis ſequitur, punctum concurſûs rectarum AK, Db, in rectâ BC contingere, quàm in (huic parallelâ) rectâ GH. Nam hic eadem verbatim dicenda eſſent;* Cum enim angulus *CPD* (*vel HRD*) ſit Novem, & angulus (*GSA*) quem facit tangens 30 graduum cum ſuâ ſecante ſit Octo, (*duodecimæ unius recti;*) & reliquus angulus (*quem faciunt producta AK, Db, nempe ſeptem duodecimæ*) complementum ad duos rectos; *Ergo, quid? Num,* Ergo rectarum *AK, Db,* punctum concurſûs eſt in rectâ *BC*? *Imò non minus ſequitur,* Ergo eſt in rectâ *GH. Sed hoc non ſequi, fatebitur* Hobbius. *Ergo nec illud.* Conſectarium *unà ruit cum propoſitione.*

Propoſitionis Duodecimæ *falſum eſt* Corollarium. *Non enim ſunt æquales CO &* $\frac{1}{2}AT$. *Sed (poſito Radio DA, vel DC,* $=R$,) *erit graduum* 30 *Tangens* $AT=\frac{1}{3}R\sqrt{3}$ (*utpote dimidia ſecantis* $\frac{2}{3}R\sqrt{3}$, *cujus quadratum complent quadrata AD & AT;*) *adeóque* $\frac{1}{2}AT=\frac{1}{6}R\sqrt{3}$. *Sed* $CO=R-\frac{1}{2}R\sqrt{2}$ (*exceſſus radii DC ſupra DO ſinum grad.* 45.) *Non ſunt ergo CO &* $\frac{1}{2}AT$ *æquales. Sed nec ille æquales eſſe demonſtrat. Et ubi hoc aggreditur* (coroll. prop. 10.) *hallucinatur. Supponit enim (quod non probat, ut ad* prop. 11. *oſtenſum eſt) rectas AK & Db in eodem rectæ BC puncto P concurrere.*

Propoſitio Decimatertia *ſubvertit primam. Nam hîc agnoſcitur & adhibetur ſectionis rectæ in extremâ & mediâ ratione conſtructio* Euclidea; *ubi recta ſecunda ad ſegmentum majus eſt ut* $2\sqrt{5}-1$, *non (ut in* Hobbianâ, prop. 1.) *ut 2 ad* $\sqrt{u:5-2\sqrt{3}}$.

Propoſitio Decimaquarta *falſa eſt. Eſt enim graduum* 30, *ſecans* $\frac{2}{3}R\sqrt{3}$; *adeoque extremâ & mediâ ratione ſectæ ſegmentum majus* $\frac{\sqrt{5}-1}{2}\times\frac{2}{3}R\sqrt{3}=\frac{\sqrt{5}-1}{3}R\sqrt{3}$. *Sed Semidiagonalis quadrati ex Radio,* $\frac{1}{2}R\sqrt{2}$. *Non ſunt igitur æquales. Ubi autem (in probatione) dicit,* Oſtenſum enim eſt prop. 10. rectam *BP* duplam eſſe rectæ *CO*: *ludit in ambiguo. Oſtenderat enim BP*, reſiduam tangentis.

gentis *CP* (*grad.* $22\frac{1}{2}$) ad radium, *duplam eſſe CO; ſed non BP* tangentem grad. 30. *Quas cum ille pro eâdem habet, hallucinatur; ut ad* prop. 11. *oſtendimus.*

Prop. Decima quintâ, *novam commendat Geometrizandi methodum, quam (credo) ipſe ſequitur. Suaſum utique it (non probatum)* In omni quæſtione Geometricâ, multò prudentius eſſe, Mechanicè menſurando magnitudinem quæſitam quam poteſt fieri veritati proximam, & deinde cauſam inquirere propinquitatis; quàm credens incertæ Logicæ vel Logiſticæ pronunciare. Et multo credibilius à Menſurâ pronunciare Menſorem diligentem, quàm Algebriſtam ſeu Arithmeticum. (*Non itaque mirandum eſt,* Hobbium, *his methodis utentem, talem nobis producere Geometriam; utpote cui Circinus eſt Calculo accuratior.*) *Sed &*, Studioſum veritatis non putandum eſſe, qui ſententiam videns ſuæ contrariam, fultam veriſimilibus argumentis (*putà, circini indicio*) contentus ſit pugnare contra demonſtrationem. (*Quaſi quidem, in re exploratâ & ſæpius demonſtratâ, non ſufficeret impugnantis paralogiſmos detegere. Sed neque hîc deſumus; nam ſua non modò Indemonſtrata, ſed Falſa eſſe demonſtramus.*) *Hoc eſt; Audiendum eſſe* Hobbium, *veriſimiliter (ex circini indicio in anguſto Schemate) ſine demonſtratione pronunciantem; quàm demonſtrativè ratiocinantes alios: Nec ſatis, eum redargutum eſſe, oſtenſis ratiocinii ſui* paralogiſmis *& demonſtrationum defectibus; aut argumentis in contrarium ſive ex* Logicâ *ſive* Logiſticâ *petitis: Quippe hæc omnia* * *cedere vult* Circino *& ſuis* Veriſimilibus. *Bellum equidem Geometram! Ego, contra,* Hobbio *ſuaderem potiùs ut* Veriſimilia *ſua &* Mechanicam menſuram (*ubi ἀκρίβεια Geometrica ſpectatur*) *Demonſtrationi (ſive ex Arithmeticâ ſive ex Geometriâ petitæ) poſthabeat; quò (quæ ſua vox eſt) minus irrideatur.*

Propoſitione Decimâ ſextâ, *affert (ſi credes)* Demonſtrationem, quæ niſi confutetur, audiendi ulteriùs non erunt arguentes à poteſtate linearum. (*Ergò nec* Hobbius, *qui, ubi poteſt, ſic arguit; ut & aliis methodis quas alibi damnat.*) *Sed confutatio facilis eſt. Quod enim aſſumit* (pag.46. lin.29.) Manifeſtum eſt tum *Kd* tum *ba* eſſe ad *ae* ut 3 ad 1; *falſum eſt. Verum quidem eſt* Kd *ad* ae *ſic eſſe; ſed non* ba. *Neque affert ille quicquam quo vel probet* Kd, ba, *invicem æquales eſſe; vel,* ba *ad* ae *eſſe ut* 3 *ad* 1. *Sed neque verum eſt: Eſt enim* Kd *ad AD ut* $\frac{1}{4}\sqrt{5}-\frac{1}{2}$ *ad* 1; *ſed* ba *ad* AD *ut* $\frac{1}{12}\sqrt{5}$ *ad* 1. *Non ſunt igitur (quod ille gratis & falſò aſſumpſit) invicem æquales* Kd *&* ba. *Et propterea falſum eſt (quod porrò habet) ba* eſſe ad Hc ut 3 ad 2; *item, fa* ad *ae* ut 3 ad 2; *item,* junctam *cd* eſſe parallelam *ID, & dH, Hb,* invicem æquales; *item, bK, da* æquales eſſe: (*Nam hæc omnia præſumunt,* Kd *æqualem rectæ* ba, *rectæque KH trientem eſſe:*) *item (quæ hinc dependent) Md* eſſe quater duo, quorum *MK* eſt ter tria; adeoque *MK* ad *MD* ſive *MF* ut 9 ad 8. *Sed & mox, dum ait, MK* quintuplum poteſt *FK* ſive *Mb*; *ſupponit (gratis quidem & falſò) FK, Mb,* (invicem æquales eſſe. Gratis, *inquam; nam ne hilum quidem affert quo probet, (niſi forſan, circino rem explorans, hoc inde collegerit:) &* Falſò; *eſt enim FK ad AD ut* $\frac{1}{4}$ *ad* 1; *ſed Mb ad AD* *ut* $\frac{1}{3}\sqrt{5}$ *ad* 1. *Adeoque falſum porro eſt*, ſi detrahatur *FK* à rectâ *MK*, reliquam eſſe *bK*. *Sed & (propter non æquales dK, ba,) falſum etiam eſt*, *bK* æqualem eſſe *da*. *Falſum igitur eſt quod ab his infert*, *MK* eſſe 9, quorum *Md* eſt 8, *Ma* 3, & *da* 5. *Neque hinc* Euclides, vel arguentes à poteſtate linearum, *evincuntur. Quippe illi falſum eſſe pronunciarent, nec probat* Hobbius *eſſe verum.*

Propoſitio Decima ſeptima, *dependet ex prop.* 14. (*ut liquet* pag. 49. lin. 14.) *quam falſam eſſe deprehendimus: Ergo & hæc ſimul ruit. Sed &* à conſect. 3. prop. 7. *dependet*, (pag. 50. l. 15.) *quod falſum eſſe oſtendimus: Adeoque duplici ruinâ labitur. Sed & alia ſubſumit falſa; ut* (pag. 49. l. 22.) rectam *Bf* quintæ partis lateris *AB* potentiâ quintuplam eſſe; *hoc eſt*, (*poſitâ* $AC=1$) $\frac{1}{5}\sqrt{5}$; *cùm tamen ſit* $\sqrt{\frac{6-\sqrt{5}}{20}}$. *Item*, pag. 50. lin. 4. *ponit latus Icoſaedri αζ; ſed idem facit, αγ*, lin. 10, 11. *Item*, lin. 9. *vult ut ſumamus* arcus *Pθ, γζ*, (*in circulis inæqualibus*) invicem æquales, (*non, ſimiles,*) *quod quomodo faciamus, nec docuit ille, nec docebit. Item*, (lin. 10.) Arcûs *Pθ*, radio *BP* deſcripti, radium alterum *Bθ* (*utpote ipſi BP æqualem*) *probat inde* æqualem rectæ *αγ* (*quæ ex conſtructione eſt ipſi BP æqualis*, pag. 49. l. 6. 12.) *ſed mox*, (pag. 50. l. 11, 12.) *vult* eandem *Bθ* minorem eſſe quam *BP* (*radium ejuſdem circuli,*) *arcúmque radio Bθ deſcriptum*, ſecare rectam *BP* in *e*; Rectamque *Bθ* (*non ipſi BP, ſed*) *Be* æqualem, hoc eſt, tertiæ parti rectæ *Bb* (*quam rectam ille perperam ſupponit æqualem arcui AC*;) & (lin. 19) eidem *Be* æqualem eſſe vult rectam *αγ* (*quæ tamen ex conſtructione* pag. 49. lin. 12. *fuerat æqualis BP, cujus pars eſt* Be *ex conſtructione*, pag. 48. l. 22.) *Adeoque, nunc αζ nunc αγ ponens pro Icoſaedri latere, rectamque αγ ſeu Bθ nunc æqualem nunc minorem rectâ BP, omnia ponit in confuſo. Poſtque hæc ita confuſa omnia, & falſis ſuffulta, ſibique invicem oppoſita;* rationem ſuam *aſſignatum it* veriſimilem, *quam* demonſtrationem *vocat* (*ineptam ſatis,*) *ſed quam rectè conjicit* Algebriſtas damnaturos, *ſed &* alios, (*quippe qui* veriſimilitudinem *ullam inibi deprehendunt*;) *Quâ quidem, ſi demonſtrandi vim haberet ullam, probaretur, non,* (*quod erat ab initio propoſitum,*) rectam *αζ* latus Icoſaedri, (*ut* pag. 50. l. 3, 5;) *ſed,* (*quò jam per oſcitantiam delapſus eſt,*) rectam *αγ* latus Icoſaedri (*ut* lin. 9, 10.) æqualem eſſe tertiæ parti (*arcûs*) ſemicirculi: (*Adeo illi indifferens eſt, ſive αζ, ſive αγ, ſit latus Icoſaedri.*) *Adeoque* ſubvertit *illud quod* probandum *ſuſceperat. Quâ tamen oſcitantiâ non obſtante, malè habet quòd pro legitimâ demonſtratione non ſimus habituri.*

Propoſitio Decima octava, (*de Circuli quadratura,*) *eſt Crambe* (*non bis tantum, ſed*) *ſæpiùs recocta; atque hæc eadem conſtructio jam tertiò ſaltem in caſſum introducta. In demonſtratione* (*prout jam tertio tentata prodit,*) *illud* (pag. 54. lin. 17, 18.) Quare reliquus *DYP* duplus eſt, tum Trilinei *CYP*, (*non; ſed, ſectoris Dbi,*) tum quadrilinei *VPbi*; *nullam habet vel ſpeciem conſequentiæ. Dum enim, pro* Sectore *Dbi*, (*quod dicendum erat,*) *ſubſtituit* Trilineum *CYP*, *quaſi hæc eſſent æqualia; præſumit id quod erat probandum. Quæ hinc dependet* Duplicatio Cubi, *nihilo* *itaque firmior eſt : Quam ut defendat, admittit (tanquam non incommodum)* 10. decimas ſextas; & 16 viceſimas quintas, æquales eſſe; (pag. 55. l. 10, 13.) *ponitque,* pag 56. l. 2. (*ut ſuis effatis conſonum*) non modò 50, 40, 32, ſed etiam 50, 40, 31¼, continuè proportionales. *Quæ pueris ridenda relinquo.*

Propoſitio Decima nona, *dependet à* prop. 5. (*ut liquet* pag. 58. lin. 8.) *quam falſam deprehendimus. Item falſum illud* (pag. 58. lin. 12.) circulum centro *l*, radio *lF* deſcriptum, tranſiturum per *G* ſimul & *C* (*Tranſibit quidem per C, propter biſectam FC in* l; *ſed non per G.*) *Probatio ejus* (pag. 58. l. 20.) *dependet à* prop. 6 *&* 7, *quas falſas deprehendimus. Deinde*, pag. 59. l. 4. *præſumit*, *rectas AH & DE productas, ad F* (*punctum in CB productâ aſſignatum*) *pertingere. Quorum neutrum probatum eſt; imò ne affirmatum, ſed tacitè præſumptum; idque falſò. Adeoque & falſa quæ ſequuntur.*

Propoſitio Viceſima *falſa eſt; utpote quæ* (pag. 61. l. 22.) *dependet à* prop. 18. *quam falſam eſſe oſtendimus. Sed, ut ut hoc in fundamento vitium non eſſet; quæ ſequitur* (pag. 62. l. 1, 2, 3, 4.) *eſt lepida deſignatio Centri gravitatis: unde, qui res has intelligit, facilè perſpiciet, quàm* Hobbius *eas non intelligit.* Conſectarium (*utpote inde dependens*) *eſt ejuſdem commatis: Sed & alio nomine vitioſum, eò quòd dependeat etiam à* prop. 5, *quæ itidem eſt falſa.*

Propoſitio Viceſima prima (*quæ &* Ultima) *item falſa eſt. In Probatione; illud,* (pag. 63. l. 14.) Gnomon *YBM* eſt quinta pars quadrati *DYQM*; *falſum eſt.* (*Nam differentia duorum quadratorum quæ ſunt inter ſe ut* 5 *ad* 4, *eſt quadrati Minoris pars* Quarta, *non quinta; Quinta verò, Majoris.*) *Sed, demus hoc: Falſum quod ſequitur,* id eſt, pars quinta quadrantis *DAC* : *Dependet enim à* prop. 18. (*quam falſam oſtendimus*) *ubi putat ſe probaſſe,* Quadrati *DYQM* & Quadrantis *DAC* æqualitatem. *Item, illud,* Quare etiam Trilineum *ABCLA* eſt quinta pars quadrati *ABCD*; *eſt pluribus nominibus Falſum. Nam, primò dicendum erat ad mentem ſuam,* quadrati *DYQM*, *non quadrati ABCD:* (*quippe ⅕ quadrantis DAC, ab eo ponitur æqualis ⅕ DYQM, non ⅕ ABCD.*) *Sed neque de DYQM verum eſt: præſumit enim* (ex prop. 18.) Trilinea *CYP*, *PQL*, eſſe inter ſe æqualia; *quod falſum eſt. Sed &, Qualis eſt ea conſequentia; Quoniam Gnomon eſt Quinta pars quadrati Minoris; Ergo Trilineum* (*quod gnomoni præſumitur æquale*) *eſt Quinta pars Majoris? Sed tales ejus eſſe ſolent conſequentiæ. Quòd autem inter duo quadrata DYQM, ABCD, ſubſultim ludat,* (*nunc de hoc, nunc de illo, idem affirmans,*) *pro ſolitâ ſuâ oſcitantia factum eſt. Cæteraque quæ ſequuntur, tanquam ab his pendentia, falſa ſunt.*

Adeoque percurrimus olens Roſetum, *brevibus ſtricturis Mendas ex innumeris multa notantes: Alia quamplurima conſultò prætereuntes, ut vel minoris momenti, vel quæ opus non erat ad ſubvertendas propoſitiones. Sed talis expectanda erat Geometria ab eo, qui, magnitudines circino dimenſus;*

quas ita non deprehendit inæquales, *pro æqualibus tuendas exiſtimat*, *etiam indemonſtratas*, *& contra demonſtrationum authoritatem*; *quam ille circino poſtponit. Gloriatum tamen audio* (*ſic ſua deperire ſolet*,) ex omnibus ab eo editis, hunc librum eſſe optimum.

Quæ autem de me habet, *ſive ad libri Calcem ſive ad Frontem*, *contemnenda ſunt. Quippe*, *præter pueriles quaſdam circa voces ineptias* (*quas in perverſum ſenſum fruſtra conatur detorquere*,) *cætera fere huc tendunt. Se* Symbola *non intelligere*; Arithmeticam ſpecioſam, *&* Logiſticam *ſibi non placere*; *ſed nec*, Geometriam Indiviſibilium; *aut*, Arithmeticam Infinitorum. (*Et quidem mihi perinde eſt*, *ſive ſic*, *ſive ſecus. Nam* j*amdiu eſt quod* Hobbij *authoritas in Mathematicis ne hilum valuerit*, *ejuſque ratiocinium*, *tantundem*.) *Sunt autem ea omnia tam crudè*, *inſulſè*, *puerìliter ab eo dicta*; *ut*, *quicunque rerum harum intelligens*, *ad loca notata reſpiciat*, *pro me facilè*, *etiam non monitus*, *ſit reſponſurus*.

Tuus Johannes Wallis.

The *Short* of this Anſwer, dated *June* 27. 1671. (which is ſtill with the Publiſher) was intended to have been inſerted in the former Tract of *June*; but ſince it could not then be conveniently done for want of room, the Anſwerer thought fit, ſomewhat to enlarge it for this opportunity.

An Accompt of ſome Books.

I. *De* MOTIONIBUS A GRAVITATE DEPENDENTIBUS *Liber* Joh. Alphonſi Borelli, *In Academ. Piſana Matheſeos Profeſſoris*: Regio Julio, 1670. *in* 4°.

THe Learned Author of this Book maintains therein, *That* all Bodies Sublunary have Gravity: *that* they exerciſe this in endeavors to approach towards the Center of the Earth: *that* the ſuperior Body or the ſuperior parts of the ſame, Solid or Fluid, do gravitate on the inferior, when at reſt: *that* there is no *Poſitive* Levity in nature: *that* Lighter bodies aſcend, becauſe thruſt out of their place by Heavier: *that* the Air is heavy, Elaſtick or Springy, and doth thereby perform thoſe things that were wont to be aſcribed to *Fuga Vacui*; *that* the ſame is capable of very great Expanſion and Contraction: that there is not in nature any proper Attraction or Suction; but things ſeeming ſo to be perform'd are done by the Pulſion or Truſion of other Bodies: *that* there is a Neceſſity and a great Uſe of *Vacuities* in nature, notwithſtanding the ſubtile and all-pervading Matter of *Des-Cartes*; with many other things conſonant hereto. For theſe Aſſertions he brings Arguments; anſwers Objections and Difficulties, and particularly thoſe that are alledged to aſſert a *Vacuum*: And from thence ſolveth a great many *Phænomena* in Nature; as, *about* the *Torricellian* Experiment and others thereunto appertaining; *about* Siphons, Pumps, Syringes, Cupping-glaſſes, &c. *about* the Nature of Fluidity; (where he examins and animadverts upon the *Carteſian* doctrine concerning the ſame:) the Aſcent of water above its Level (in ſmall Pipes and otherwiſe;) and its contracting it ſelf into Globular drops: *of* its Expanſion in Freezing, and its Strength thereupon: *of* the Degrees of Velocity in lighter Bodies aſcending in Water; and of Water running out of Tubes or other Veſſels perforated at the bottom: *of* Fermentations; and Diſſolving Salts, Mettals, &c. in liquid Menſtruum's: with many more, too numerous to repeat here.

II. Diſſertationes duæ Medicæ *de* VENENO PESTILENTI: *Studio* Caroli de la Font, *M. D. & in Acad. Avenion. Prof. primar. Amſtelodami, in* 12°.

IN the former of theſe two Diſſertations the Author treateth of the Nature and Cauſes of the *Plague*, without any recourſe to Occult Qualities, or the Influence of the Stars; deducing the Peſtilential Venom from the Air infected and corrupted *chiefly* by Arſenical

Exhalations, either breathed in at the Mouth or Noſe, and ſo affecting the Lungs and Brain, or piercing through the Skin into the other parts of the Body, and there working, not by *Coagulation* (as Dr. *Willis* would have it, on whom the Author animadverts, though very civilly,) but by *Corroſion*, which, in his opinion, depends not from Heat or any other of the four Firſt Qualities, celebrated in the Schools, but from a certain Conformation of Salin corroſive particles, manifeſt in *Arſenick* by many effects, here ſpecified, and particularly thoſe, that have been obſerved in the Bodies of ſuch as dyed of the Plague, in which not only the interior membrane of the Stomach, but alſo all the Bowels have been found corroded, black, ſphacelated and corrupted. Yet he denieth not, but that with this *Arſenical* venom ſome other, and eſpecially *Mercurial*, Vapors may concur, which being joyned and ſublimed together with other Volatil particles become highly deſtructive, being taken into ſuch Bodies, as were prediſpoſed, before others, to receive them by their depraved conſtitution, or by a too great fulneſs of bloud, or obſtructions, or perturbations of humors cauſed from fancy, fear and conſternation, &c.

As for the Spreadingneſs of the Plague, he eſteems, and endeavors to evince, that it is not ſo Contagious as is commonly believed, but that, whereas there are ten perhaps that get it by infection from others, there are thouſands that are ſtruck with it from the Air, harbouring the ſeeds of it in a peſtilential conſtitution.

In the *other* Diſſertation the Author delivers the ſeveral Means of Curing the Plague; either by expelling, or diſperſing, or intangling, or rebating, or fixing, or impeding the penetration of thoſe Corroſive particles, that invade the Body; where he mentions the ſeveral remedies, by him judged proper in the ſaid reſpective methods: Concluding with a diſcourſe about the beſt wayes of Preſervation from the Plague; of which he preſcribeth principally theſe three, either by Retiring a far off, or by Correcting, or by Fortifying our ſelves againſt the Peſtilential Air; adding his thoughts, how the two latter wayes may be beſt performed.

III. *Tractatus de* CORDE, *item de* MOTU *&* COLORE SANGUINIS, *& Chyli in eum tranſitu: Cui acceſſit Diſſertatio de Origine* CATHARRI. *Auth.* Richardo Lower, *M. D. Editio tertia & noviſſima.* Amſtelodami 1671. *in* 8°.

HAving already given an Accompt of the principal part of this Treatiſe in *Numb.* 45. of theſe Tracts when it was printed the firſt time; we ſhall here only add ſomething about the newly annexed Diſſertitaon of the *Origin* and *Cure* of *Rheumes*. As to their *Origin*, the Learned Author, having declared, with the generality of Phyſitians, that Rheumes are bred from the Serous part of the Bloud, ſever'd from it by an impeded Tranſpiration, he undertaketh to evince the erroneouſneſs of the Vulgar opinion, deriving all ſorts of Defluxions from the Brain, by ſhewing, that, whereas the Authors and Teachers of that Tenet do acknowledge, that the Water collected in the Ventricles of the Brain deſtilleth only through the *Os Cribri-forme* into the Noſe, and through the *Glandula pituitaria* into the Palat; the Structure of thoſe parts is ſuch, that that can be done neither of theſe wayes; which aſſertion of his is accompanied with divers conſiderable Obſervations and Experiments; as alſo with an Anſwer to thoſe, that apprehend great danger to the Brain from the excrementitious matter gathered therein, if it ſhould not be purged out from thence by the Eyes, Noſtrils, Ears and the Palat. Which being diſpatched, he proceeds to ſuggeſt the wayes of ſtopping and curing Defluxions, by obſerving, that, ſince the Matter for Rheumes is furniſhed by the *Serum* of the Bloud, whatever is able to withdraw that *pabulum*, or to precipitate the ſeroſity through the Kidneys, or to convey it away by ſiege, or to diſpell it through the pores of the Body, is ſufficient to perform the cure.

IV. Franciſci de le Boe Sylvii *M. D. & Prof. Oratio de AFFECTVS EPIDEMII, A.* 1669. Leidam *depopulantis*, *CAVSIS NATVRALIBVS.* Lugduni Batavorum, 1670. *in* 12°.

THis Learned Diſcourſe, together with the Firſt part of the *Praxis Medicæ Idea Nova*, was lately in ſeveral Copies preſented from the Worthy Author, both to *his Majeſty*, and to the *Royal Society*, and particularly to the Noble Preſident and divers Eminent Members of the ſame for their Examination. And as we gave very lately a freſh Accompt (in *Numb.* 71.) of the ſaid *Firſt part* now perfect, after we had taken ſome notice of it formerly, (in *Numb.* 40.) when it was yet incompleatly printed; ſo we cannot omit to give here a Breviat of this ingenious Oration.

In it the Author declareth and endeavors to prove, that the late waſting Diſeaſe in the City of *Leiden* is to be imputed to theſe concurrent ſecond Cauſes, *viz.* The Exceſſive Heat, long continued Calms, want of Rain, and the Vapors of Standing and Muddy waters abounding in that place, together with certain Salin and noxious Exhalations of the Earth, by the force of the Sun propelled into the Air, and there mingled with the former. From which, being well conſider'd, he eſteems, that all the various and even the moſt different and grievous Symptoms, that were obſerved in the ſick people at *Leiden* may be rationally derived; adding thereunto his Opinion of the Cauſe, why Rich and Delicate perſons were firſt of all and ſooner attacked and deſtroyed by that Diſeaſe, then thoſe of the Poorer and Hardier ſort of people; though theſe latter fell in greater numbers about the end of this Sickneſs, than the former.

In the diſcourſe about the ill effects of a tainted Air upon Human Bodies, he taketh occaſion to inſinuate, That as 'tis difficult to prove, ſo 'tis hard to deny, that ſome part of the inſpired Air is alſo commixed with the *Saliva*, and being together with other Humors, falling from the Brain and its Glanduls and the glandulous Tunicles, derived to the Mouth and Throat, and ſo ſwallow'd together with the ſame, cauſeth in the Stomach and ſmall Guts ſome alterations in the humors there found or meeting together. But as he thinks this not improbable, ſo he judgeth, that there are yet required many accurate Obſervations to clear up and eſtabliſh ſo obſcure a Doctrine.

V. *HYPOTHESIS PHYSICA nova, ſive THEORIA MOTUS CONCRETI, una cum THEORIA MOTUS ABSTRACTI. Auth.* Gothofredo Guilielmo Leibnitio, *J. V. D. & Conſiliario Moguntino.* Londini *Impenſis* Joh. Martyn, *R. Societatis Typographi, ad inſigne Campanæ in Cœmeterio D. Pauli*, 1671. *in* 12°.

THe Ingenious Author of this ſmall Tract, though by profeſſion a Civilian, and one of the Privy Counſel of his Electoral Highneſs of *Maintz*, and upon that Accompt very much taken up with publick affairs, is yet ſo much pleaſed with the ſtudy and ſearch of Nature, that whatever hours he can redeem from his State-employment, he ſpends in that which he judgeth incumbent upon him as Man, I mean the Contemplation of the works of God and Improvement of Natural Philoſophy. What he hath therein performed, he imparts in this *Hypotheſis* to the Learned world, and dedicateth it to the *Royal Society* of *England*, and the *Royal Academy* of *France*, deſirous in his Letters to have their thoughts concerning the ſame; wherein he maketh it his buſineſs to ſhew, that by the help of it the Cauſes of moſt of the *phænomena* of Nature may be rendred from one ſingle and univerſal Motion, ſuppos'd in our Globe, neither croſſing the *Copernican* nor *Tychonian* Hypotheſis; the Author having ſo managed the whole, as that all Sects may bear and admit what he here produceth, without a prejudice to their own Opinions.

A Copy of this Tract being Communicated, beſides others, to the Excellent Dr. *Wallis*, Fellow of the *R. Society*, and *Savilian* Profeſſor of Geometry in the Univerſity of *Oxford*, with a deſire to examine the ſame, and to give his judgment thereof, he was pleaſed to make a return in Latin, which for want of room here, we muſt refer to another opportunity.

VI. *PHILOSOPHUS AUTODIDACTUS, exhibitus in Epiſtola, ex Arabica in Latinam Linguam verſa ab* Edvardo Pocokio, Oxonii 1671. *in* 4°.

THis Book being tranſlated out of a fair *Arabick* Manuſcript in the ckian *Bodleian* Library into *Latine* by the care of the Learned Dr. *Pocock*, and printed in both the Languages together, is a very ingenious piece, and, by the teſtimony of the skilful, elegant in the Original, and an excellent ſtyle. The deſign is to ſhew, How from the Contemplation of things here below, Man by the right uſe of his Reaſon may raiſe himſelf unto the knowledge of higher things; which is here perform'd by a *Faigned Hiſtory* of an Infant expoſed, he knows not how, on an Iſland not inhabited; where he was nurſed up by a *Gazel* (or kind of wild Dear) and coming afterwards to years of knowledge, did by his ſingle Uſe of Reaſon and Experience (without any human converſe) attain the underſtanding, firſt of Common things, the neceſſaries of human life; how to ſhift among the Beaſts for his food, &c; the uſe of cloaths, of weapons (to keep the beaſts in order, who were before too hard for him;) then to the knowledge of Natural things, of Moral, of Divine, &c. And afterwards by an accident coming to know that there were other men in the world beſide himſelf, and being removed out of his Iſland to them, and having learned the Language, was found to excell their ſtudied Philoſophers.

The whole deſign handſomely laid, and ingeniouſly proſecuted. The Epiſtle written by *Abi Jaafar*, contemporaneous to *Averroes*, who lived about 500 years ago; at which time, it ſeems, it was already known, that the Countries in the *Torrid Zone* were habitable, as appears by the Preface of Dr. *Pocock* to the Reader.

ERRATA.

N°. 68. p. 2064. l. 36. r. *Cichory-flowers, but alſo Lark-ſpur, Borage.* N°. 70. p. 2134. l 7. r. *Muſcus* for *Fungus.*

In this *Numb.* 73. p 2193. l. 5. r. *as compreſt the Air.*

LONDON,

Printed for John Martyn, *Printer to the Royal-Rociety.* 1671.

PHILOSOPHICAL TRANSACTIONS.

Auguſt 14. 1671.

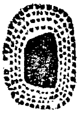
The CONTENTS.

An Intimation of divers Philoſophical matters, at preſent undertaken and conſider'd by ſeveral Ingenious and Learned men, as concerning the freſh Obſerving of Spots in the Sun; a new Edifice now a building at Paris *for Philoſophical purpoſes; two Diſcourſes, the one of* Viſion, *the other of the Art of* Levelling; *Tinctures drawn out of the Excretions of Inſects; the non-neceſſity of the Circulation of Sap in Trees; the Diſcovery of* Ovaria *and* Ova *in all ſorts of Animals; and the Invention of divers Ingenious Engines and Inſtruments at* Jena *in Germany. An Extract of Mr.* Ray's *Letter, touching Spontaneous Generation, and ſome Inſects ſmelling of Musk. An Extract of Mr.* Willoughbies *Letter about the Hatching of a kind of Bee in Old Willows. A further Accompt of the* Stellar-Fiſh, *formerly deſcribed by Mr.* Winthrop *in New England. An Extract out of the* Venetian Giornale de Letterati, *concerning the formation of* Fætus's. *Dr.* Wallis's *opinion concerning the* Hypotheſis Phyſica nova *of Dr.* Leibnitius, *promiſed in the fore-going* Numb. *of theſe Tracts. An Accompt of ſome Books. I. A Diſcourſe touching the ORIGINAL* of *HVMAN LITERATURE. by* Theophilus Gale. II. *JOH. JOACH. BECCHERI EXPERIMENTVM CHYMICVM NOVVM, being a Supplement to the PHYSICA SVBTERRANEA of the ſame Author.* III. *De ABSYNTHIO Analecta, per* Joh. Michael Fehr. IV. *DE LAVDANO OPIATO, Auth.* Matthia Tillingio.

An Intimation of divers Philoſophical particulars, now undertaken and conſider'd by ſeveral Ingenious and Learned men; here inſerted to excite others to joyn with them in the ſame or the like Attempts and Obſervations.

FIrſt, we have notice given us, that at *Paris* the Excellent Signior *Caſſini* hath lately detected again *Spots* in 2234 the Sun, of which none have been ſeen theſe many years, that we know of. 'Tis hoped that that learned Aſtronomer will ſhortly publiſh a Deſcription of what he ſhall have obſerved of this kind. Mean time we cannot but acquaint the Curious, that, as far as we can learn, the laſt obſervation in *England* of any *Solar Spots*, was made by our Noble Philoſopher Mr. *Boyl*, vvho, upon an occaſional diſcourſe of this Subject, vvas pleaſed to communicate vvhat he had obſerved of this kind, as he found it regiſtred in his *Notes*, viz.

Friday, April 27. 1660. *about* 8 *of the clock in the Morning, there appear'd a Spot in the lower limb of the Sun a little towards the South of its* Æquator, *which was entred about* $\frac{1}{40}$ *of the Diameter of the Sun, it ſelf being about* $\frac{1}{100}$, *in its ſhorteſt Diameter, of that of the Sun; its longeſt, about* $\frac{1}{40}$ *of the ſame. It diſappear'd upon Wedneſday Morning* (*May* 9th) *though we ſaw it the day before about* 10 *in the morning to be near about the ſame diſtance from the Weſt-ward limb a little South of its* æquator, *that it firſt appear'd to be from the Eaſt-ward-limb, a little South alſo of its* æquator, *It ſeem'd to move faſter in the middle of the Sun than towards the limb. It was a very dark Spot almoſt of a quadrangular form, and was encloſed round with a kind of duskiſh cloud, much in this form and in this proportion to the Spot.*



We firſt obſerv'd this very ſame Spot both for figure, colour and bulk, to be re-enter'd the Sun May 25th, when it ſeem'd to be in a part of the ſame line it had formerly traced; and was enter'd about $\frac{4}{33}$ *of its Diameter about 7 of the clock in the afternoon. At the ſame time there appear'd another Spot, which was juſt entred and appear'd to be entred not above* $\frac{1}{132}$ *part of the Sun's diameter. It appear'd to be longeſt towards the North and South, and ſhorteſt towards the Eaſt and Weſt. There ſeem'd to be diſpers'd about it divers ſmall clouds here and there.*

Theſe Obſervations vvere made, as the Noble Obſerver told us, vvith an excellent Teleſcope, in the preſence of divers Curious and Ingenious perſons, one of vvhom was Mr. *Hook*. And diſcourſing of the thoughts he had entertain'd touching the Effects of ſuch Spots, he ſuggeſted this Inquiry, Whether they might not cauſe a conſiderable alteration both in the Body of the Sun it ſelf, and in our Air and the Bodies in it upon their diſſipation?

Secondly, vve underſtand, that at *Paris* the *Royal Obſervatory*, now a building for making Celeſtial Diſcoveries, is very far advanced, and will ſhortly be in a condition to be employed for the uſe intended; whence vve may expect a conſiderable advancement of the Aſtronomical Science. In the ſame Edifice, vvhich the ſaid *Obſervatory* maketh a part of, we are inform'd that there is, beſides many other rooms fit for Philoſophical uſes and purpoſes, a very deep Cave, having an hundred threeſcore and ten ſteps of deſcent; wherein many ſorts of Experiments are intended to be made, being of that nature, that they require to be remote from the Sun-beams and the open Air; ſuch as are Thermometrical ones, and ſuch as concern Refrigerations, Coagulations, Indurations, and Conſervations of Bodies, and a thouſand things more.

Thirdly, vve hear, that the Learned Monſieur *Mariotte* is publiſhing two very deſirable Diſcourſes, the one of *Viſion*; upon vvhich ſubject he hath diſcovered ſomething new and conſiderable: the *other* of the Art of *Levelling*, vvherein he delivers many remarkable particulars about Refraction, and the Errors, that may, upon the account thereof, be impoſed upon men; together with ſeveral New Inſtruments of Levelling exactly.

Fourthly, vve find by Letters out of *Germany*, that the learn'd Phyſitian Dr. *Kornmannus*, is printing a Book concerning the Tinctures or Eſſences of the Excretions of Inſects, which having fed upon ſeveral herbs and flowers, yield ſuch dungs, vvherein the tincture, colour and vertue of theſe vegetables are to be found: Thus for example, he can extract a curiouſly red tincture out of Excrements of Worms that have fed upon Roſes, *&c.*

Fifthly, vve find by Letters out of *Italy*, that a very Ingenious perſon there, upon the conſideration of what hath been lately intimated touching certain Experiments for finding out, whether there be a Circulation of Sap in Trees, reſembling that of Bloud in Animals; Offers it to the conſideration of Naturaliſts, Whether it be likely to find a place in Vegetables, whence the Sap may part, and whither it may return, ſuch as is the Heart in Animals; adding, that whereas Vegetables are alwayes to put forth new branches, leaves, *&c.* it ſeems to be ſufficient for them, that there be a continual and plentiful courſe and ſupply of Juyce, to thruſt out every way, without any neceſſity of ſuch a Circulation.

Sixthly, whereas it hath been more than once mention'd in theſe Papers; * *Mulierum teſtes eſſe Ovario analogos; nec tantùm in nuptis & fœcundis Mulieribus, ſed etiam in Virginibus eſſe Ova vera*, &c. We cannot but ſignifie here, for further inquiry, that there hath been very lately made by two Phyſitians at *Paris* a diſſection of a Cow, *in cujus teſticulis ova reperta fuerint, uti Kerkringius obſervaſſe ſe ſcripſerat in Anthropogeniæ ſuæ Ichnographia*; and that *there* they intend to purſue this Inquiry, inviting others to make the ſame reſearch. Wherein ſince the learned Dr. *Walter Needham*, an Engliſh Phyſitian, and a worthy Fellow of the *R. Society*, hath heretofore already been converſant to good purpoſe, it is here publikely wiſhed, that he would make a further progreſs in the ſame; *plures*

* See *Numb.* 32. p 628, and *Numb.* 70 .p. 2136.

inſtituendo diſſectiones, catellarum imprimis valdè juvenum, &c. *ad rei certitudinem majorem.*

Seaventhly, from *Germany* we are inform'd, that in the Univerſity of *Jena* in *Upper Saxony*, one Mr. *Weigbelius*, Profeſſor of the Mathematicks there, hath invented ſeveral ingenious Inſtruments and Engins; As firſt, an Aſtronomical one, which he calls *Aſtrodicticum*, by the means whereof very many perſons ſhall be able at one and the ſame time to behold one and the ſame Star. Secondly, An exceeding great *Globe* of the *World*, capable of ten perſons to ſit in it all at once, and to behold the motions of the celeſtial Bodies, *&c.* Thirdly, An *odd Bridge*, or a kind of Stairs, by which a man ſhall deſcend and yet really be raiſed upward, and going as 'twere upon a plain ſhall, from a lower, by gently ſubſiding, arrive to an upper ſtory, *&c.* Of theſe and other particulars, ſaid to be in part already done, and in part deſign'd by the ſaid Mathematician, we hope we ſhall in time obtain a more ſatisfactory accompt.

The Extract of a Letter written by Mr. John Ray *to the Publiſher from* Midleton, *July* 3. 1671. *concerning Spontaneous Generation; As alſo ſome Inſects ſmelling of Musk.*

Sir,

As to the particulars contain'd in your Letter, I well remember, that Mr. *Liſter* did, a good while ſince, write me his opinion concerning *Vegetable Excreſcencies*, and the Inſects therein bred and harboured; but the Letter containing that Diſcourſe I have not at preſent by me, it being ſent away in a bundle of other Letters and papers into *Eſſex.* I have therefore written to him to deſire him, to take the pains himſelf to ſend you his thoughts upon that ſubject. *

Whether there be any *Spontaneous* or Anomalous *Generation* of Animals, as hath been the conſtant opinion of Naturaliſts heretofore, I think there is good reaſon to queſtion. It ſeems to me at preſent moſt probable, that there is no ſuch thing; but that even all Inſects are the natural iſſue of parents of the ſame *ſpecies* with themſelves. *F. Redi* hath gone a good way in proving this, having cleared the point concerning generation *ex materia putrida.** But ſtill there remain two great difficulties. The *firſt* is, to give an accompt of the production of Inſects bred in the By-fruits and Excreſcencies of Vegetables, which the ſaid *Redi* doubts not to aſcribe to the Vegetative Soul of the Plant that yields thoſe Excreſcencies. But for this I refer you to Mr. *Liſter*. The *ſecond*, to render an accompt of Inſects bred in the Bodies of other animals. I hope ſhortly to be able to give you an accompt of the Generation of ſome of thoſe Inſects, which have been thought to be *ſpontaneous*, and vvhich ſeem as unlikely as any to be after the Ordinary and Uſual vvay.

---

* *The Reader is like to find this Accompt in the Tranſactions of the next Month.*

Of ſuch an Inſect, as you mention, feeding upon *Ranunculus*, vvhich vvhen dried yields a Musky ſcent, I have no knowledge. I can at preſent call to mind but two ſorts of Inſects that I have ſeen, which ſmel of Musk. The *one* is like the common *Capricornus* or *Goat-chaſer*, which is mention'd by all Naturaliſts that vvrite of Inſects, and vvhich ſmels ſo ſtrong of that perfume, that you may ſcent it at a good diſtance as it flies by, or ſits near you. The *other* is a ſmall ſort of *Bee*, vvhich in the South and Eaſt-parts of *England* is frequently to be met withal in Gardens among flowers in Spring-time. I remember, they vvere very plentiful in Sir *Edw. Duke*'s *Tulip-Garden*, vvhen the Tulips flowred. Sir *Edward* is now dead; his houſe was not far from *Saxmundham* in *Suffolk*; the name of the Pariſh I have forgot.

I have by me the Deſcription and Anatomy of a *Porpeſs* (vvhich fiſh I happily met vvithal at *Weſt Cheſter*) in vvhich there are ſome particulars, that I find not in the Deſcriptions of *Rondeletius* or others, which, if you pleaſe, I ſhall ſend you *. I reſt, *&c.*

---

* Of this Author an Accompt was given in *Numb.* 66. p. 2436.

* When this ſhall come to hand, we intend to communicate it to the Curious, the ingenious Auther permitting it.

An other Extract of a Letter written from Midleton *in* Warwickſhire *to the Publiſher July* 10th. *by* Francis Willughby *Eſquire*; *about the Hatching of a kind of Bee, lodged in Old Willows.*

THe Cartrages that I got at *Aſtrop** near a Twelfmonth ago, do now almoſt every day afford me a *Bee*; and I can hear them gnawing out their way before I ſee them: So that there is nothing irregular in the way of breeding of theſe Bees; But the contrivance of God and Nature in it is very admirable. Having ſhut their yong ones in thoſe Cels with ſufficient proviſion, they all, as well the uppermoſt as lowermoſt, before Winter come to their full growth, or are turn'd into *Nympha*'s; in vvhich condition they are deſigned to lye all Winter, as the moſt of Inſects do. The next Summer thoſe muſt neceſſarily be firſt excited out of their *torpor*, and changed into flyers by the external heat and ayr, that lye next it. If any be laid ſo late, that they have not time enough to come to the ſtate of *Nympha*'s before Winter, they vvill moſt certainly dye; and then it is no loſs nor inconvenience, though their Cells be perforated.

The *Scolopendra*, ſpoken of by the *German* Philoſophers in *Numb.* 68. *p.* 2082. §. 31. of the *Tranſactions*, is that which is [illegible] *Bruchus*, deſcribed [illegible] *Muffet*, in the latter part of his Chapter *de Julis*, *p.* 202. I ſaw it in the Cloiſters of *Trinity* Colledge in *Cambridge*, 12 or 13 years ago. It ſhall go hard, but I will ſend you ſome ſhortly. I am, &c.

* See two Letters concerning this matter, in *Numb.* 65. of theſe Tranſactions.

A further Accompt of the Stellar Fiſh; *formerly deſcribed in* Numb. 57. *p.* 1153; *with the Addition of ſome other Curioſities.*

THis Accompt was communicated by the ſame Gentleman, that imparted the former, in a Letter written from *Boſton* in *New England Oct.* 26. 1670. as followeth;

—— Since my former, I found out the Fiſherman who brought that *Stellar Fiſh* from Sea. I asked all the queſtions I could think needful concerning it. I underſtood from him, that he never ſaw nor heard of any but thoſe few, that were taken by himſelf, which were not above ſix or ſeven in all, and thoſe at ſeveral times, not far from the Shoals of *Nantucket* (which is an Iſland upon the Coaſt of *New England*,) when he was fiſhing for Cod, and ſuch like Marchantable fiſh. This *Stellar Fiſh*, when it was alive, and firſt pull'd out of the water, vvas like a basket, and had gathered it ſelf round like a Wicker-basket, having taken faſt hold upon that bait on the hook, which he had ſunk down to the bottom to catch other Fiſh, and having held *that* within the ſurrounding *brachia*, would not let it go, though drawn up into the Veſſel; until by lying a while on the Deck, it felt the want of its natural Element, and then voluntarily it extended it ſelf into the flat round form, in which it appear'd when preſented to your view.

What motion theſe fiſhes had in the water, could not be known to him, for the water was deep, & they could not be ſeen in any other form than ſo gather'd up together to hold faſt the bait. The only uſe that could be diſcern'd of all that curious compoſure wherewith Nature had adorned it, ſeems to be, to make it as a purſenet to catch ſome other fiſh or any other thing fit for its food, and as a basket of ſtore to keep ſome of it for future ſupply, or as a receptacle to preſerve and defend the young ones of the ſame kind from fiſh of prey; if not to feed on them alſo (which appears probable the one or the other;) for that ſometimes there were found pieces of Mackerel within that concave: And he told me, that once he caught one, which had within the hollow of its embracements a very ſmall fiſh of the ſame kind, together with ſome piece or pieces of an other fiſh, which was judged to be of a Mackerel. And that ſmall one ('tis like) was kept either for its preſervation or for food to the greater; but being alive, it ſeems moſt likely it was there lodged for ſafety, except it were accidentally drawn within the net, together

ther with that piece of fiſh, upon which it might be then feeding.

He told me further, that every one of thoſe ſmalleſt parts* had motion when it was alive, and a tenacious ſtrength; but after it was dead and extended to a flat round, it was ſo britle that it could not be handled without breaking ſome parts of it; but by careful laying of it to dry, it was thereby ſomewhat hardened.

He added, that he had taken one of this kind of fiſh the latter end of this Summer, but had left it with a friend at another port where he had been. Mean time he promiſed to procure it for me when he ſhould ſail thither again, if it vvere not then broken or defaced. I hope I ſhall engage him for the future to take better notice of what may be remarkable about it. Upon occaſion I have inquired of divers other Fiſhermen and Mariners, but can meet with none other that ever have taken any of theſe fiſhes. This Fiſherman could not tell me of any name it hath, and 'tis in all likelihood yet nameleſs, being not commonly known as other Fiſh are. But, until a fitter *Engliſh* name be found for it, why may it not be called (in regard of what hath been before mentioned of it) a *Basket-Fiſh*, or a *Net Fiſh*, or a *Purſe-net-Fiſh*?

I ſend you withal a litle Box, with a Curioſity in it, which perhaps will be counted a trifle, yet 'tis rarely to be met with even here. It is the curiouſly contrived Neſt of a *Humming-Bird**, ſo called from the humming noiſe it maketh whil'ſt it flies. 'Tis an exceeding litle Bird, and only ſeen in Summer, and moſtly in Gardens, flying from flower to flower, ſucking Hony out of the flowers as a Bee doth; as it flieth not lighting on the flower, but hovering over it, ſucking with its long Bill a ſweet ſubſtance. There are in the ſame Neſt two of that Birds Eggs*? Whether they uſe to have more at once, I know not. I never ſaw but one of thoſe Neſts before; and that was ſent over formerly, with ſome other Rarities, but the Veſſel miſcarrying you received them not.

---

* See the Figure of the Fiſh in *Numb.* 57.

* Of which ſee a notable Deſcription in the Hiſtory of the *Antiles l.1.c.15.art.17.* where it hath the name of *Colibry.*

* Theſe Eggs were ſo ſmall, that being weighed by the Publiſher, the one weighed but about 5 grains, the other 3½: And the whole Neſt weighed no more then 24 grains.

An Extract out of the 3d *and* 7th Venetian Giornale de Letterati, *concerning the* Formation *of* Fætus's.

THe Author of theſe Journals, propoſeth in the *third* of them this Inquiry, *viz.*

Wherein conſiſts the *cauſa formatrix* of the *Fœtus*; whether in the native Heat, as the Ancients taught; or in Motion, as the Moderns are inclined to believe: And if the latter, whence that motion proceeds, and how it is diverſified for the conſervation of various ſpecies's?

The Journaliſt having been informed, that Signor *Gieronymo Barbato*, publick Profeſſour of Practical Phyſick at *Padua*, and Phyſitian in *Venice*, had written a Book upon that ſubject, and illuſtrated it with new Anatomical Diagrams, all ready for the Preſs; did, it ſeems, obtain the peruſal of the Original Manuſcript, and permiſſion withal, to make an Extract thereof, which in this Journal he preſents the Curious with, to ſtay their deſire whil'ſt the whole Diſſertation is printing. This Breviate we thought fit to *Engliſh* here out of the *Italian*, as followeth;

The Author, Signor *Gieron. Barbato*, firſt delivers the chief Sentiments of the Ancients and Moderns concerning the *Formative Soul*; ſhewing that from variety of thoſe Opinions there reſults nothing but darkneſs. He alſo mentions ſome others touching the uſe of the *Teſticles*, whom he modeſtly refuteth, animadverting upon ſome Errors both of old and new Anatomiſts. Then he diſcourſeth of ſome principal parts conſtituting the ſame, which he thinks have not been rightly obſerved hitherto: And beginning with the *vaſa pampiniformia*, he affirms, that they are made up of a great many Arteries, and of one only Vein, and that this vein, being conſiderably big, is circularly ſcituate, that ſo it may the more conveniently unite it ſelf, by a curiouſly contrived *anaſtomoſis*, to thoſe many Arteries. Then he deſcribeth the *Uſe* of theſe *Pampiniform* veſſels, informing us, That the ſaid Arteries are not *directly* inſerted into the ſubſtance of the Teſticles (as the moſt famous Anatomiſts have believed;) but that they form, on the ſide, another membrane hitherto un-obſerved, (altogether different from the *Albuginea*, and the two others, call'd the *Elytroides*,) which being made up of veſſels, reſembleth the *Meninges* of the Brain, and is by him eſteemed to have the like uſe with it. And thereupon he ſhews, that from the Arteries of that Membrane do preceed ſome ſmall Arteries, for the moſt part double in their origin, but afterwards becoming one, and ſo paſſing into the ſubſtance of the Teſticles; but when they are come to the center of them, returning to the abovesaid membrane without being accompanied by the veins: Where he renders a reaſon, why in the ſubſtance of the *Teſticles* there are no veins; and ſhews, that in the return of the ſaid arteries there appear ſome other ſmall veſſels, which contain no aliment, but only ſeminal matter; and that theſe do frame in the midſt of the Teſticles another whitiſh ſmall membrane, very like the *Septum lucidum*; which membrane, receiving veſſels from all the parts of the Teſticles, except from the back-part, does therefore grow crooked there, and thereby hath deceived that famous Anatomiſt Dr. *Highmore*, perſwading himſelf that it is a round and pervious veſſel. Moreover he ſaith, that the Curvature of the ſaid litle membrane ſerveth for a kind of ventricle, to purge away an aqueous moiſture, ſeparated, by means of the medullar ſubſtance of the Teſticles, from the ſeminal matter contained in the veſſels. He obſerveth further, that the ſmall membrane reſtrains it ſelf towards the upper part, and it being ſuch an one as conſiſts of minute veſſels, there remain yet in that place ſome of them, though very ſmall ones, which may be obſerved by a Microſcope to be diſſeminated in that litle coat, which paſſeth into the *Albigunea* near the *Pampiniform*, and is inſerted into the *Epididymis*; whence paſſing through a glandul above the *Epididymis*, it there depoſeth a wateriſh humidity, like that which the double membrane brings with it from the center of the *Teſticles*, and which through the *Lymphatic* veſſels is conveyed towards the *Vrethra*, and comes away before the ejaculation of the *ſemen prolificum.* And the ſaid litle veſſels afterwards multiplying themſelves exceedingly,and being divided into ſmall Cells, do with a wonderful curious contrivance form the *Epididymis*: Where he diſcovers the errour of him, who believed the *Epididymis* could be ſever'd from the Teſticles without laceration; aſſigning withal the Uſe of that part differently from all other Anatomiſts. Thence he paſſeth to the *Paraſtatæ Varici-formes*, which emulating the *Epididymis*, appear alſo to be full of pretty big veſſels, ſcituate after a curiouſly contrived manner, and make a nobler ſhew than that of the *Epididymis* it ſelf, it having the reſemblance of an Heart. And declaring the uſe of the *Paraſtatæ*, he ſaith, that they do not terminate in a *nervous* body, but plainly in a *Nerve*, by him call'd the *vas deferens*, which, he eſteems, carries nothing elſe but ſtore of animal ſpirits, which yet according to him are not generated *in* the Brain, (nor tranſported by the Nerves into the Teſticles,) but *in* the ſmall veſſels, which make up the medullar ſubſtance of the very *Teſticles*; which being at laſt obliterated in the *Paraſtatæ*, are changed into a thick membrane, of which is formed the *vas deferens*, ſenſibly pervious; that ſo, by the abolition of the lately mention'd ſmall veſſels, it may receive abundance of ſeminal ſpirits, called *animal*, they being produced from one and the ſame matter,and in one and the ſame manner. And that they are ſo, he further proveth from this obſervation, that the two litle Nerves, taken notice of by Anatomiſts, are inſerted only in the external part of the Teſticles, receiving their internal ſenſe and motion from the ſaid ſpirits, generated as above. And here he maintains, that theſe Spirits are the Senſitive and Moving Soul, and conſequently the *Anima formatrix*, and that there is no other proximate inſtrument, ſave the *Intellective* ſoul, *quæ deforis venit & divina eſt*.

Beſides he endeavours to prove that opinion to be falſe, which holds the *Seed* to be an Excrement of the laſt Aliment, and maketh it out, that a ſmall quantity of Seed excerned, enfeebles more than the loſs of much Blood. He refuteth thoſe that have taught the original of the Seed from the Brain; as alſo thoſe, that have believed it to proceed from the whole Body. He aſſigneth the manner, how this Spirit is corporified and incraſſated, and why 'tis ſo? proveth experimentally, that being ſubtilized by the warmth of the *Vterus*, it becomes a very fine Spirit; refuting, on this occaſion, the opinion of *Galen*, importing that from the corpulency of the *Semen virile* the ſpermatick parts are generated, and aſſerting on the contrary, that theſe are formed *de ſero utili ſanguinis menſtrui.* By the ſame Experiment he undertakes to evince, that Dr. *Harvey* was miſtaken, believing the *Vterus* to be immaterially made fecond, when he found nothing of a ſeminal body in the wombs of all thoſe Animals open'd by him. Beſides he teacheth, how the *Semen* is mixed *cum menſtruis*; and how it is moved ſutably to the diverſity of kinds. He examins, how the ſolid parts are generated, and refuting all other opinions about this point, he maintains that they are produced all at once, though they be diſcern'd at different times, according to the greater or leſs neceſſity of thoſe parts. He ſhews, how they become ſenſitive, and begin to have life, contending that they are not nouriſh'd till they are ſenſible. He explains, from what cauſe and for what end the Heart is moved; what thing the *punctum ſaliens* is, and upon what account it hath been reputed to be the Heart. And having attempted to reſolve many difficulties, he thinks he hath determined many other curious and conſiderable particulars by experimented principles.

Dr. Wallis*'s opinion concerning the* Hypotheſis Phyſica Nova *of Dr.* Leibnitius, *promiſed in* Numb. 73. *and here inſerted in the ſame tongue, wherein it was written to the Publiſher,* April. 7. 1671.

2213

Clariſs. Vir,

Legi ego ſemel atque iterum, quam impertiiſti, *Dn.* Leibnitii *Hypotheſin Novam, de qua opinionem meam petitis,*

Authorem quod ſpectat, ut ut de nomine (quod memini) mihi ignotum prius, æſtimare tamen debeo, ut qui, in magno loco inter magna negotia poſitus, vacare tamen poteſt liberæ philoſophiæ, & rerum cauſis inveſtigandis, quique ad multa reſpexiſſe videtur. Opus quod attinet, multa ibi reperio ſumma cum ratione dicta, quibuſque ego planè aſſentior, ut quæ ſint ſenſis meis planè conſona. Talia ſunt; Debere Phyſicum ad Mechanicas rationes, quoad ejus fieri poteſt, omnia accommodare, §.15. Nihil ſeipſum, ex abſtracti Motûs rationibus, in lineam priorem reſtituere, etiam ſublato impedimento, niſi accedat nova vis, §.22. Omnia corpora ſenſibilia, ſaltem dura, eſſe Elaſtica, *atque* ab Elatere oriri Reflexionem, §. 21. (*Quæ meis de Motu hypotheſibus Tranſactionibus Philoſophicis * jam antehac inſertis, omninò congruunt; quæque in Mechanicis ſeu* de Motu Tractatu *fuſius proſequor* cap. 11: 13.) *Item,* Attolli gravia, non metu Vacui, ſed propter Atmoſphæræ æquilibrium, §. 25. Levitatem *verò* per accidens tantùm ſequi ex Gravitate, gravioribus minus gravia ſurſùm pellentibus, § 24. Irruptiotionem Aeris (ſed & Aquæ, *&c.*) in vas exhauſtum, ob Aeris Gravitatem & Elaterem fieri, §. 26. *Nec non,* Exhauſti atque diſtenti (*ut loquitur*) effectus, unde Fermentationes, deflagrationes & diſploſionum omne genus; nempe diſplodente altero quod alterum abſorbet (*ſeu admittit potiùs,*) §. 27. 39, 40. *Nam & hæc etiam ab Elatere fiunt, in Contento, vel in Continente, vel in utroque;* illîc, *explicante ſe quod nimis fuerat compreſſum;* hîc, *contrahente ſe quod nimis diſtentum fuerat; quippe utrovis modo, nedum utroque, fiet irruptio vel exploſio, dummodo locus ſit quò recipi ſine impedimento poſſit quod ejiciendum fuerit. Suntque hæc planè conſona traditis noſtris* Mechan. c. 14.

* Numb. 43.

Sed & illud, Gravitatem in Inferioribus oriri ex motu (*vel preſſu*) ſuperioris Ætheris, §. 13. 16. *magnâ ſaltem veriſimilitudine dicitur. Quanquam enim gravitatis cauſa (ut & Elateris) tam ſit in abſcondito, ut mihi nondum uſquequaque ſatisfactum ſit quid in ea re ſtatuam, Naturæ tamen phænomena,* Pulſione *quàm* Tractione *feliciùs utplurimum expli-*

cantur. *Aliáque multa ſunt quæ repetitu non eſt opus, quæ magnâ veriſimilitudine, ſi non & certitudine, dicta judico; quæque per ſe ſatis conſiſtunt independenter ab aliis: neque enim ita inter ſe connexa ſunt omnia, ut uno vacillante cætera ſimul ruant.*

De tota verò Hypotheſi ne quid ſtatim pronuntiem, id ſaltem facit, quòd non ſim pronus Ego (in rebus ſaltem pure Phyſicis, non Mathematicis,) aſſenſum novis placitis adhibere, donec vel Eruditorum ſententiis in utramque partem ventilatis quid ſtatuendum ſit rectiùs conſtet, vel ipſâ ſui evidentiâ (quod in veris Hypotheſibus non raro fit) veritas eluceat. Fundamentum Hypotheſeos Novæ *repetit ex* Abſtracta ſua Motûs Theoria (*quam non vidi, ut nec Tractatûs hujus poſteriora, quæ paſſim citantur**,) *nempe*, Quod nulla ſit Cohæſio Quieſcentias, ſed omnis conſiſtentia ſeu cohæſio oriatur à Motu, §. 7. 12. 34. (*quod cum* Gulielmi Nelii* *noſtri placitis coincidit.*) *Contra verò Honoratiſſimus* Boylius, *cum aliis, Conſiſtentiam in particularium quiete, & Fluiditatem in earundem continuo motu collocat. Alii ad varias Atomorum figuras, hamatas & variè implicitas, rem referunt. Neque ego is ſum, qui in tanta ſententiarum varietate me vellem arbitrum interponere. Sed tempori res permittenda eſt, & doctorum in utramque partem rationibus. Quippe idem ferè obtinet in novis Hypotheſibus, quod in Oſcillationibus Pendulorum; ubi, poſt crebras hinc inde reciprocationes factas, tandem in perpendiculo fit quies. Id vidimus in* Hypotheſi Copernicana, *quæ utut fuerit Veteribus cognita, tamdiu tamen ſepulta jacuit ut pro Nova haberetur: Et quamvis optimâ eſſet ratione ſuffulta, non tamen ſtatim obtinuit, ſed à variis fuit variis modis impetita, & acriter diſceptata, donec tandem rationibus authoritati prævalentibus ita jam univerſim admittitur, ut vix quiſpiam harum rerum gnarus de ea dubitet niſi quibus Cardinalium decretum præjudicio eſt. Et quanquam* Tycho *novam illius loco ſubſtituerit quæ illi equipolleret, tot tamen ea in-*

---

* Primâ enim vice nonniſi Hypotheſeos hujus priorem partem, ad uſque ſcil. p. 48, Author per literas tranſmiſerat, ſine *Abſtracta Motûs Theoria.*

* Juvenis hic erat geniò planè philoſophico, è **Societate Regia**, præmaturâ nuper morte nobis ereptus.

commodis eſt onerata, ut exiſtimandus videatur potiùs ad frangendam invidiam id feciſſe (quoniam Telluris Motus *ita vulgi opinionibus horribilis videbatur,) quàm quod* Copernicã *Hypotheſin ex animo repudiaverit. Idem dicendum de* Circulatione Sanguinis Harvæana, *quæ utut optimè fuerit ſtabilita, & oculorum* αὐτοψίᾳ *comprobata, diſceptata tamen fuit inter Londinenſes Medicos viginti plus minùs annis antequam in publicum prodiret, & ab aliis deinceps : Quæ tamen poſt maturam rei penſitationem (quod tempori dandum erat) ab omnibus ut indubitata recipitur. Sic* Galilæi Hypotheſis (*ob Antlias, aquam non ultra certam altitudinem attrahentes, primùm excogitata) quam* Torricellius *in graviori liquido adeóque magis tractabili promovit, Æquilibrium Atmoſphæræ pro Veterum* Fuga vacui *ſubſtituens, non niſi poſt diutinas hinc inde diſputationes eum apud viros doctos locum obtinuit quem jam habet. Idem dicendum de* Jolivii *noſtri* Vaſis Lymphaticis, *ante multos annos Medicis Londinenſibus ab illo indicatis atque ab eis admiſſis & approbatis; quæ tamen ita rationi conſona reperta ſunt & oculari inſpectioni manifeſta, ut tandem longo pòſt tempore inter alios aliquot acriter diſputaretur, quis eorum primus Inventor fuerit,* &c. *Idem in hoc negotio aliiſque Novis hypotheſibus exſpectandum, quæ nec oculi inſpectione nec certâ demonſtratione probari poſſunt, ut ſi veris rationibus fundatæ ſint, tandem, ſed non niſi poſt velitationes utrinque factas, in liberè philoſophantium animis locum obtineant; interea pendulæ manſuræ. Clariſſimo interim Viro habendæ gratiæ, qui eam de* Societate *noſtra opinionem concepit, ut ſenſa ſua illis communicare, novámque ſuam* Hypotheſin *(rem certè ipſis non ingratam) exhibere dignatus fuit.* Vale.

Tuus

JOHANNES WALLIS.

After that the other part of this Tract was (a great while after) come to hand, namely *De Abſtracta Motûs Theoria*, and ſent alſo to the ſame Dr. *Wallis*, he made this return to it in a Letter of *June* 2. 1671.

Clariſſ. Vir,

A*Ccepi nuperrimè à Te tranſmiſſam D.* Leibnitii Theoriam Motus Abſtracti, *de qua judicium meum petitur. Duo autem ſunt quæ ſuadeant ne illud præſtem. Alterum, quòd res invidioſa videatur de aliorum ſcriptis cenſuram agere: Alterum, quod occupatiſſimo tempore huc advenerit, quo ægrè vacavit ſemel atque iterum attentius perlegere, nedum omnia perſpiculatius conſiderare. Quoniam verò Tu id expetis, hæc pauca dicam. Multa ſcil. inibi contenta Ego planè approbo, ut ſubtiliter & ſolidè dicta, quæque Virum curioſum & cogitabundum indicant. Si pauca ſint quibus non ſtatim aſſentiar, ignoſcet, ſpero, vir humaniſſimus. Et ſpeciatim, fateor, mihi nondum ſatisfactum eſſe, ut, primis ſaltem cogitationibus, ſtatim aſſentiar, Cohæſionem omnem ex continuo celerique ſed inobſervabili particularum motu fieri (quod ille* Theoriæ motus Concreti *fundamentum ponit;) uti nec pridem, cùm ante aliquot annos, ſimilem* Quietis *& Cohæſionis cauſam aſſignaverat* Nelius *noſter. Quod olim aliquando futurum ſit, poſt rem accuratiùs perpenſam, nec dicere poſſum nec prævidere. Interim ego ἀπέχω, nec quicquam in aliorum præjudicium pronuntio; quin liberum cuique ſit, eam quam rationi magis conſentaneam judicaverit, ſententiam amplecti.* Vale.

Tuus

JOH. WALLIS.

An Accompt of ſome Books.

I. A Diſcourſe touching the *ORIGINAL OF HUMAN LITERATURE*, both *PHILOLOGY* and *PHILOSOPHY*; in two Parts: By *Theoph. Gale* M. A. Oxford, 1669. and 1671. in 4°.

The Buſineſs of this Book is, to derive *Human Arts* and *Sciences* from the *Jewiſh Church*; for the doing of which the Author profeſſeth he hath been encouraged by conſiderable hints and aſſiſtances of the *Scaligers*, and of *Grotius*, *Voſſius Bochartus*, *Selden*, *Uſher*, *Preſton*, and others, beſides the concurrent teſtimonies of many of the Ancients.

In the *Firſt* part he endeavours to prove, that all *Languages* have their origin and riſe from the *Hebrew*; inſtancing particularly in the *Oriental* Tongues, as the *Phenician*, *Copthic*, *Chaldaic*, *Syriac*, *Arabic*, *Perſian*, *Samaritan*

and

and *Ethiopic* ; and then in the *European*, eſpecially the *Greek*, *Latin*, the old *Gallic* and *Brittannic*. To which he adds a deduction, importing, that the Pagan Theology, Phyſick, Politicks, Poeſie, Hiſtory, Rhetoric, are traduced from Sacred Names, Perſons , Rites and Records ; and ſhewing withal, How the Jewiſh Traditions came to be corrupted and miſtaken by *Pagans*.

In the *Second* part he maketh it his buſineſs to evince, that *Philoſophy* alſo hath its Original from the *Jewiſh Church*; beginning to ſhew this of the *Barbaric* Philoſophy, under which he comprehends the *Egyptian*, *Phenician*, *Chaldean*, *Perſian*, *Indian*, *Ethiopic*, *Scythian*, and *Britannic* ; and thence proceeding to the *Grecian*, and chiefly to the *Ionic* , and *Italic* or *Pythagorean* ; where he ſhews great reading and learning, whil'ſt he deduceth this doctrine of Judaic Origin from the Teſtimonies of Heathen , Jewiſh , and Chriſtian, both Ancient and Modern, Authors ; paſſing through all the particular *Sects* of Philoſophers with great ſolicitude and induſtry; and promiſing at the end of this Work, that he is willing to undertake another Treatiſe, to ſhew both the *Miſchief* of *Vain* , and the *Vſefulneſs* of *Sound* Philoſophy to Chriſtian Religion , if this Hiſtorical Accompt, deliver'd in theſe two Parts, (and mainly deſigned in Order thereunto) find any ſuch reception , as may give encouragement to ſuch Labours.

II. *Joh. Joachimi Becheri* Spirenſis Med. Doct. *EXPERIMENTUM CHYMICUM NOVUM*, quo Artificialis & Inſtantanea Metallorum *Generatio* & *Tranſmutatio* ad oculum demonſtratur. Francofurti, A. 1671. in 8°.

This Tract was written by the Authour as a *Supplement* to his *Phyſica Subterranea*, likewiſe printed at *Frankford* , about two years ſince, though yet but in part, there being hitherto extant only the firſt Book of the two, of which it is to conſiſt : which *Firſt* part (to give ſome accompt of it on this occaſion) undertaketh to explain both the abſtruſe Generation of Subterraneous things, and the admirable Fabric of the Super-terraneous and Subterraneous complex Globe of Earth, Air and

Water: Promiſing to deliver hereafter in the *Second* Book, the *particular* Nature of under-ground Bodies, and withal to teach the Reſolution of them into parts and the proprieties of thoſe parts; together with an *Appendix* that ſhall contain a great number of Chymical Mixtures, never ſeen before, and grounded upon numerous Experiments. We cannot forbear giving the Reader, of that great variety of matter and Trials, contain'd in the ſaid Firſt Book, one very conſiderable Experiment, ſaid to have been actually made by the Authour himſelf, and which ſeems worth repeating for further obſervation and improvement. It is in ſhort this, as it may be found *p.* 170, 171. *Phyſicæ Subterraneæ.*

Having a mind, for a certain end, to melt a *Jaſper*, he ſaith, he put it into a crucible, and actually melted it by an intenſe fire, and ſome other requiſites neceſſary to the operation. But to the end that no coals might fall into the paſt, he cover'd and luted the crucible, which was about half fill'd with Jaſper-ſtone: which being now melted, he open'd the crucible when cool, and, to his great wonder, found at the bottom the Jaſper melted together into one Maſs, as hard as before, but Milk-white and half opaque, reſembling a natural *White* Agat; but the cover, and the upper parts of the crucible, that were un-fill'd, and could not be touched by the Jaſper in the melting, were tinged with the natural colour of the Jaſper; inſomuch that if there had been the hardneſs of a Jaſper and the colour not ſuperficial only, the fragments of the crucible might have been ſold for the beſt and moſt poliſh'd Jaſper, having here and there greeniſh ſtreaks and ſpecks, the reſt being red and yellowiſh; all ſo beautiful, that a good Painter would ſcarce have been able to imitate thoſe various colours. Of this, the Author ſaith, he keepeth ſtill the peices in his Laboratory at *Munchen* in *Bavaria*, as a very extraordinary treaſure; eſteeming that thoſe upper parts were tinged by the *anima* of the Jaſper, driven up by the force of the fire from its inferiour part, and adhering to the body of the crucible.

Having thus related this uncommon experiment, we

ſhall

ſhall proceed to ſay ſomething of the Contents of this *Supplement*, which occaſion'd that relation. It ſeems then, that the learn'd Dr. *Rolfink*, Profeſſor of Phyſick in the Univerſity of *Jena* in Upper Saxony, in his Book, entitled, *Chymia in Artis formam redacta*, affirms, that the current Mercury of Bodies is a *Non-Ens*: which our Author looking upon as an ungrounded and precarious Aſſertion, labours in this Tract to confute it, from Authority, Reaſon and Experiment, as may be ſeen *pag.* 81, *&c.* That which we ſhall take here particular notice of, is that Chymical Experiment, which giveth the Title to the Book, and is called *New*, alledged to prove the real and ſudden Generation and Tranſmutation of Mettals. You may take it thus, if you pleaſe;

He took common Brick-earth, dry'd it in the Air that it might be ſifted; then poured ſo much Linſeed-oyl upon it as that he might role it into little balls, of the ſize of the Retort's neck, which they were to be put into, to the end, that the diſtillation being made, he needed not to break his retort for the taking out of the *Caput mortuum*, but might reſerve it for other uſe. That the fire might the more forcible penetrate thoſe globuls, than if the matter were in one Maſs, he filled the Retort with them, and by degrees diſtill'd them with an open fire, during an hour or two. This diſtillation being finiſh'd, he found in the Recipient an Oyl almoſt like that, which he ſaith is improperly call'd *Oleum Philoſophorum*; then the Retort being cool'd, he took the little balls out of it, which not being found red, by ſo ſtrong a fire, but very black, he ſuſpected that blackneſs proceeded from the Oyl, ſome terreſtrial parts of which, being fix'd and ſever'd by vertue of the Brick-earth, might there have aſſumed a Body; which of what kind it was, was now further to be examin'd by trial. Having therefore beaten ſmall theſe black globuls, and ſifted them, he put them into a diſh, and having powr'd ſome common water upon it, he ſtirr'd it; then being grown turbid, he gently powred it off, and powred on freſh clear water, ſtill ſtirring the matter: which he ſo often repeated and continued, till the water came clear away, and there remain'd at the bottome of the diſh a ponderous black ſediment, which from its weight and ſudden ſubſidence, as alſo from its dark colour he ſuſpected to be of a Metallick, and indeed of an Iron nature; which being dry'd upon paper, upon the application of a Load-ſtone, was thereby attracted in ſeveral grains, which by all proofs he found to be very good Iron.

Eſteeming hence, that ſulphureous Spirits may be fixed by a certain Earth as their *Matrix*; he ſaith, that he employ'd the ſame method with all Minerals, Sulphurs, and Mercury it ſelf, and accordingly melted various Minerals with various Earths and Clays; whereby he diſcovered many Truths & Tranſmutations. And to convince his Readers of the reality of this Experiment, he ſpends a whole Chapter to prove the truth of the matter of fact, and of the genuineſs of the Iron produced; examining withal, whether that Iron thus produced had not been latent either in the Earth, or in the Oyl, and ſo might have impos'd upon him; and having found, it had not, he inquireth, what may be the *Metallick* cauſe in *general* in this Experiment; and in *particular*, what the *Ferrifick* (if we may be allow'd to frame ſuch a word) or the Iron-making Principle, &c.

III. De *ABSYNTHIO* Analecta, per *Joh. Michael Febr*, M. D. *Lipſiæ* 1668 in 8°.

Several Learn'd men in *Germany*, having aſſociated themſelves, ſome years ſince, into a Company under the Name of *Academia Naturæ Curioſorum*, reſolved to undertake, each of them, the Deſcription of ſome particular ſubſtance in Nature, conſidering with themſelves how long the world had been fruitleſly amuſed with Generals: Of thoſe particulars we only named ſome in *Numb.* 68. *p.* 2078. but ſhall now endeavour to give an accompt in the remainder of this Tract, of ſome performances of theſe undertakings;

Beginning here with the Treatiſe concerning *Wormwood*, which but very lately came to our hands. In it the Author deſcribeth *firſt* its Nature, enumerateth its differences, obſerveth its vertues, teacheth divers preparations, and delivers its manifold Uſes, eſpecially in ſtrengthening and recovering the ſtomack and all the parts of the lower Belly; in curing the Colick, Scurvy, Jaundies, Dropſie, &c. in opening the Obſtructions of the Liver and Spleen; in expelling Worms, and driving away Moths, and other like vermine, &c.

After this, he endeavors to ſolve divers *Queſtions* propoſed upon this ſubject, as, 1. Whether the bitterneſs may be taken away from Wormwood without deſtroying its vertues? which is reſolved in the Negative. 2. Whether the Salts, called Eſſential, have the ſame vertue with their Simples? *Anſw.* in the Affirmative. 3. Whether the Reſuſcitation of Plants be naturally poſſible? Affirm'd, as to their rerepreſentation, &c. *Laſtly*, he concludeth with an Enumeration of *Bitter* things; which are found among Roots, Herbs, Stalks, Leaves, Flowers, Seeds, Berries, Fruits, Barks, Wood, Gums, Juyces, Oyls, Extracts, Powders; obſerving withal, that generally all *Bitter* things have the power to comminute, to be aſterſive, opening, and purgative, more or leſs.

CROCOLOGIA. Auth. *Joh. Ferdinando Hertodt* M. D. *Jenæ* 1671. in 8o.

This Author giveth us the Anatomy of *Saffron*, and having deſcribed it, and aſſigned its differences from its different nature, time of production, colour, flower, leaves; and withal found the ſeveral Country's of its growth, and ſhew'd the way of its Culture and Propagation: He proceeds to relate its Vertues and Uſes; in the doing of which he recommends it, and the ſeveral preparations thereof (of which he ſets down not a few,) againſt the Head-ache, Palſy, Vertiginous diſtempers, Epilepſie, Lethargy, Intercepted Reſpiration (call'd the *Incubus*,) Phrenſie, Inflammations and Suffuſions of the Eyes, Tingling of the Ears, Squinancy, Cough, Pleuriſie, Palpitation of the Heart, Nauſeouſneſs, Hæmorrhoids, Dyſenteries, Diarrhæa's, Colicks, Inflammation of the Liver, Dropſie, Jaundies, Obſtructions of the Liver and Spleen, Hypochondrical diſtempers, the Stone, the difficulty of Excretion by Siege or Urine; the Green ſickneſs, Infecundity, Suppreſsion of the *Menſtrua*, Hyſteric paſsions, Hard Travel, Inflammation of the Breaſts, Burnings, Gangrens, the Kings Evil, &c.

This Enumeration being made, and a great number of Receipts, of which Saffron is the chief Ingredient, interſperſed, there are ſubjoyned ſeveral *Quæries*, viz.

1. Whether Saffron be an Antidote to the poyſon of *Napellus?* It being affirmed ſo to be, the Author adds a Relation of a conſiderable Phyſitian concerning the *Polanders* frequent and harmleſs eating of *Napellus* in their Salats; the reaſon whereof is aſcribed to the common uſe of Saffron by that people.

2. Whether Saffron removeth or cauſeth a ſurfet? This is treated as diſputable.

3. Whether it induceth ſleep or wakefulneſs? And this queſtion is here debated, *pro* and *con*, yet ſo as that the Author endeavours to reconcile the diſputing parties.

4. Whether *Saffron* tingeth the *Fœtus* in the womb? Here are alledged ſeveral Experiments for the affirmative, of which the Author ſaith to have made one upon a Bitch with puppy, which brought her young ones forth yellowy-colour'd, after he had given her, for a good part of her bearing time, all her meat and drink tinged with Saffron, and for three dayes, immediately before her whelping, put ſome drachms of Saffron in her broth.

There are alſo inſerted ſome Mechanical uſes of this Vegetable for tinging of Hair yellow; for making a liquor to write golden-colour'd Letters with; and gilding of Leather, *&c.*

IV. De *LAUDANO OPIATO*, Auth. *Matth. Tillingio* M. D. *Francofurti*, 1671. in 8°.

This Treatiſe hath four Parts. The firſt contains the Origin of the *Opiat Laudanum*, and the Praiſes of its Uſefulneſs in general; together with a diſquiſition of its Temperament, and whether *Opium* be poyſonous in its ſelf, and may be uſed uncorrected, *&c?* The latter part of which queſtion is here reſolved in the *Negative*.

The *Second* treats of the genuine correction of *Opium*; delivers ſeveral deſcriptions of the Opiat Laudanum, much eſteem'd both by Galenic and Chymical Phyſitians; preſcribeth the Doſe and way of uſing it; and withal anatomiſeth and ſtrictly examins his own preparation of this Medicin; adding ſome cautions to be obſerved in the Uſe thereof.

The *Third* contains various Compoſitions of Opiat Medicines, or ſuch as have Opium or the Opiat Laudanum for their chief Ingredient; together with an enumeration of their particular Vertues.

The *Fourth* ſpecifieth thoſe Maladies and diſtempers, in which this *Laudanum* is ſingularly beneficial, made out both by Reaſon and the obſervation of the Authour aſwell as of many other famous and worthy Phyſitians. Here are reckon'd up Head-aches, Sleepleſneſs, Phrenſies, Giddineſs, the Falling ſickneſs, Hæmorragies, Pleuriſies, Bloud-ſpitting, Coughs, Conſumptions, Faintings,

tings and Soundings, Feavers, Colicks, Fluxes, virulent Gonorrhæa's, Hyſterical diſtempers, *&c.*

As to the ill ſucceſs which at times hath attended the taking of *Laudanum*, our Authour aſcribeth *that* either to the unskilful preparation, or the unſeaſonable and indiſcreet exhibition of it. In the preparation he obſerveth, that the malignity that is in *Opium*, is beſt corrected by *Alcaly*'s, as having the force of taming that Narcotic ſulphur, contain'd in it; agreeing herein with *Helmont*'s Maxim, *Omne Narcoticum perit in Alcaly.*

Advertiſements.

Since the printing of the foregoing particulars, there came to hand the New Obſervations above mentioned, of the *Spots of the Sun*, in Print, made at the *Royal Academy* in *Paris*, the 11th, 12th, and 13th of *Auguſt*, 1671. (*ſt. n.*) by Signor *Caſſini*; who intimateth at the end of his *French* Narrative concerning the ſame (which is intended to be *Engliſh'd* for the next Tract,) that from about *Sept.* 4th, until *Sept.* 18. (*ſt. n.*) it will be worth while to obſerve, whether the ſame Spots after they have paſſed over the upper Hemiſphere of the Sun, which is hidden to us, will not return again and appear in its apparent Diſque.

The ſame Spots have been obſerved, (as by a Letter from Dr. *Fogelius* at *Hamburg* we were alſo very lately inform'd,) at Sea near the *Teſſel*, by M. *Picard*, one of the Royal *Pariſian* Philoſophers, namely *Aug.* 4. (*n. ſt.*) and ſome of the following days; as alſo at *Hamburg* the 7th, 8th, 9th of *Auguſt*, (*n. ſt.*) Of which more alſo by the next opportunity.

What we have to add now (which muſt not be defer'd) is the Prediction, made by the ſame Signor *Caſſini*, of the Eclipſes of the *Satillits* of *Jupiter*, calculated for *Uraniburg*, and annexed here, to the end that our Aſtronomers, having reduced them to our *Latitude* and *Longitude*, may alſo obſerve the ſame.

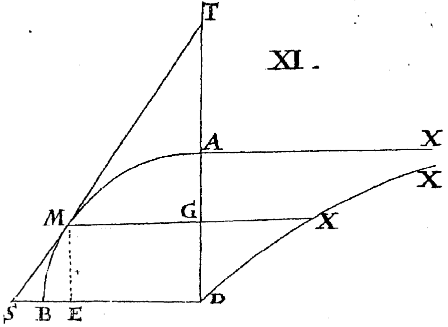
The Immerſions of the Satellits *of ♃ into its ſhadow, viſible at* Uraniburg, *A.* 1671.

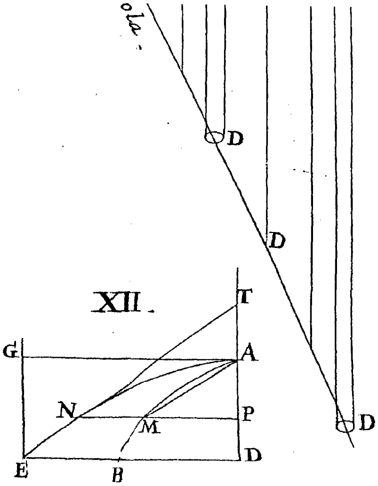
Sept. 25.	*Immerſio* 1^{mi} *mane*	h. 4. 16'.	Decemb. 3.	*imm.* 1. —	h. 5. 8'.
Oct. 11.	*immerſ.* 2^{di} ——	h. 4 26.	8.	*imm.* 4^{ti}. —	h. 0. 10.
18.	*imm.* 1^{mi} ——	h. 4. 43.		*Emerſio* ——	h. 5. 10.
25.	*imm.* 1. ——	h. 6. 41.	12.	*imm.* 1. —	h. 1. 29.
Nov. 7.	*imm.* 3. ——	h. 2. 37.	14.	*imm.* 2. —	h. 4. 6.
10.	*imm.* 1. ——	h. 4. 51.	19.	*imm.* 1 —	h. 3. 19.
12.	*imm.* 2. ——	h. 4. 18	20.	*imm* 3. —	h. 1 52.
14.	*im.* 3. ——	h. 6. 37.	21.	*imm.* 2. —	h. 6. 49.
17.	*imm.* 1. ——	h. 6. 49.	26.	*imm.* 1. —	h. 5. 9.
19.	*imm.* 1. ——	h. 1. 20.	27.	*imm.* 3. —	h. 5. 92.
	& 2^{di} ——	h. 7. 1.			
26.	*imm.* 1. ——	h. 3. 10.			

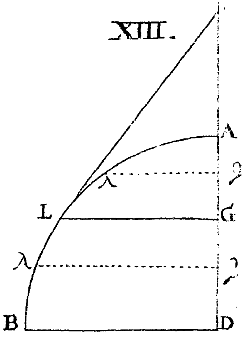
Errata. In Numb. 73. p. 2202. l. ult. r. *ſecandâ*, p. 2204. l. 24. r. *pauciores*, p. 2205. l. 38. r. *ut* 2 *ad* $\sqrt{5}-1$. p. 2206. l. 40. r. *MK ad Md.* p 2207. l. 11. r. (*pag.* 49, *l.* 22.) ibid. l. 29. r. *quippe qui ne.* p. 2208. l. 41. r. *menda.* l. 43. r. *erant*, p. 2214. l. 8. inſtead of *Bodlejan* r. *Pocockian*; for it was in Dr. *Pocok*'s own Library.

In this *Numb.* 74. p. 2224. l. 10. r. *how* for *here*. p. 2226. l. 9. r. *thence he*, p. 2228. l. 8. r, *quoad ejus.* p. 2229. l. 16. *quieſcentis.* ib. l. 19. *coincidit.*

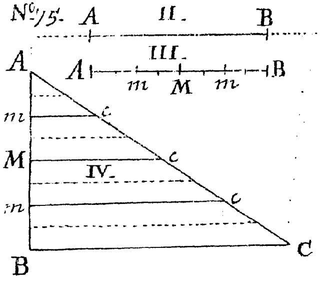
London, Printed for *J. Martyn*, Printer to the Royal Society, 1671.

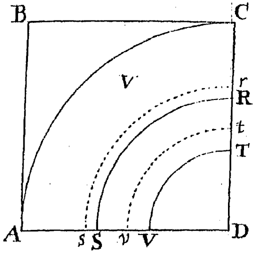

XI.

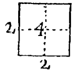

XII.

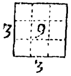

XIII.

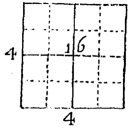
N°75.

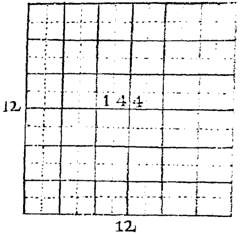

II.
III.
IV.


V.


VI.


VII.


VIII.


IX.

N°75.

Tab. I. Trans. No 75.

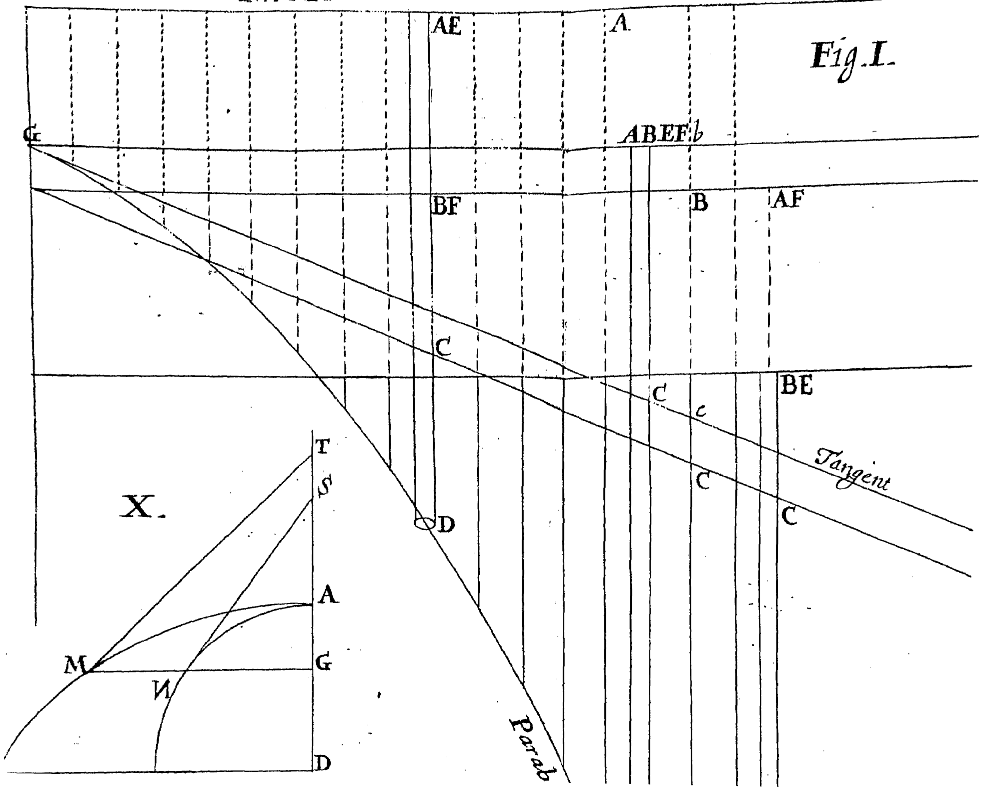


Fig. I.

X.

Numb. 75.

PHILOSOPHICAL TRANSACTIONS.

Septemb. 18. 1671.

The CONTENTS.

A Supplement to what was publiſh't N. 73. of the Compreſſion of Air *under* Water. *An Anſwer to Four Papers of Mr.* Hobs, *lately publiſh't. New Obſervations of* Spots *in the* Sun. *An Accompt touching* Vegetable Excreſcencies. *A Deſcription of ſome Books*: I. & II. *Lectiones OPTICÆ & GEOMETRICÆ, Auth.* Iſaaco Barrow; *together with a* Mantiſſa *of the ſame Author to ſome of thoſe Lectures.* III. *A Continuation of the MEMOIRES of M.* Bernier *concerning the Empire of the G.* Mogol. IV. *Hiſtoria & Meteorologia INCENDII ÆTNÆI. A.* 1669. *Auth.* Joh. Alph. Borello. *Advertiſement touching the* Latin *Verſion of part of theſe* Tranſactions.

A Supplement to what was publiſh't N. 73. of the Compreſſion of Air *under* Water.

2192

AT the deſire of a particular Friend, the *Scheme* in *Tab.* I. *Fig.* I. was drawn, and is now permitted to be made publick at the requeſt of another, by way of Supplement to what was ſaid in the *Philoſophical Tranſactions* N. 73. of the Compreſſion of Air under Water: In which *Figure*

ED is made to repreſent the Tube, $= x$.

AB the diſtance of the upper part of the Tube from the ſurface of the water above or under it, $= b$.

FC the depth of the water from its ſurface to the bottom of the Air within the Tube, $= a$.

BC that part of it which remains fill'd with Air within the Water.

CD the reſt thereof which is full of water.

And any two of the three firſt, x, b, and a, being given, the other is known, and conſequently the reſt alſo.

For, if by the incumbent weight of 33 feet depth in water, the Air in the tube is compreſt into half the ſpace it fill'd before; then the ſaid 33 feet depth of Water equals the weight or preſſure of the incumbent Air on the ſurface of the Water.

Now, as the weight or preſſure of the Air on the ſurface of the Water, is to the Depth of the Water from the ſurface thereof to the bottom of the Air within the Tube; ſo is the Length of the Tube fill'd with Air, to the length thereof fill'd with Water: That is, according to the ſaid Experiments, putting z for 33, or whatever, at other times or places, ſhall be found to be the weight or preſſure of the incumbent Air on the ſurface of the Water, (for it is not always the ſame exactly;) $z.\ a :: a \pm b.\ \frac{a^2 \pm ab}{z} = CD.$

And therefore $\frac{a^2 \pm ab + za \pm zb}{z} = x.$

Wherefore $\frac{z}{z+a} x - a = b.$

And $\frac{\sqrt{: b^2 \mp 2zb + z^2 + 4zx :} \mp b - z}{z} = a.$

And therefore *a* and *b* being given, x is known to be the firſt æquation; And *a* and x being given, *b* is known by the ſecond; And *b* and x being given, *a* is known by the third.

The Horizontal line BFBAF is ſubſtituted for GABEFb, when the Cloſe end of the Tube is not even with the ſurface of the Water, to avoid the breach $cC = bB = \frac{1}{4z} b^2$ in the length of the Tube.

Note,

That the Perpendicular immerſion of the Tube or Cylinder, ſpoken of in the ſaid *Tranſactions* N. 73. is not to be underſtood of the Depth of the bottom or open end in the water, but of the Depth of the Air within the Tube or Cylinder from the ſurface of the water, *viz.* FC, not FD.

An Anſwer to Four Papers of Mr. Hobs, *lately Publiſhed in the Months of* Auguſt, *and this preſent* September, 1671.

In the former part of his firſt Paper;

BY reaſon of a Propoſition of Dr. *Wallis* (*Prop.* 1. *Cap.* 5. *De Motu*) to this purpoſe (for he doth not repeat it *Verbatim*:) *If there be ſuppoſed a row of Quantities infinitely many, increaſing according to the natural Order of Numbers,* 1,2,3,&c. *or their Squares,* 1,4,9,&c. *or their Cubes,* 1,8,27,&c. *whereof the laſt is given. It will be a row of as many, equal to the laſt, in the firſt caſe, as* 1 *to* 2; *in the ſecond caſe, as* 1 *to* 3; *in the third, as* 1 *to* 4, &c. (Where all that is affirmed, is but; *If we SVPPOSE That; This will Follow.* Which Conſequence Mr. *Hobs* doth not deny: and therefore all that he ſaith to it, is but Cavilling.)

Mr. *Hobs* moves theſe Queſtions, (and propoſeth them to the *Royal Society*, to paſs a judgment on them.) 1. *Whether there can be underſtood* (he ſhould rather have ſaid, *ſuppoſed*) *an infinite row of Quantities, whereof the laſt can be given.* 2. *Whether a Finite Quantity can be divided into an Infinite Number of leſſer Qnantities, or a Finite quantity conſiſt of an Infinite Number of Parts.* 3. *Whether there be any Quantity greater than Infinite,* 4. *Whether there be any Finite Magnitude of which there is no Center of Gravity.* 5. *Whether there be any Number Infinite.* 6. *Whether the Arithmetick of Infinites be of any uſe, for the confirming or confuting any Doctrine.*

For anſwer. In general, I ſay, 1. Whether thoſe things *Be* or *Be not*; yea, whether they *Can* or *Cannot be*; the Propoſition is not at all concerned, (which affirms nothing either way;) but, whether they can be *ſuppoſed*, or made the *ſuppoſition*, *in a conditional Propoſition.* As when I ſay, *If* Mr. Hobs *were a Mathematician, he would argue otherwiſe*; I do not affirm that either *he is*, or ever *was*, or *will be* ſuch. I only ſay (upon ſuppoſition) *If he were*, what he is not; he would not do as he doth. 2. Many of theſe *Quære's* have nothing to do with the Propoſition: For it hath not one word concerning *Gravity*, or *Center of Gravity*, or *Greater than Infinite*. 3. That uſually in *Euclide*, and all after him, by *Infinite* is meant but, *More than any aſſignable Finite*, though not Abſolutely Infinite, or the greateſt poſſible. 4. Nor do they mean, when Infinites are propoſed, that they ſhould *actually Be*, or be *poſſible to be performed;* but only, that they be *ſuppoſed.* (It being uſual with them, upon [illegible]

[illegible]

may; [illegible] (for it is not poſſible for any man to produce a ſtreight line Infinitely;) but, that it be *ſuppoſed.* And if AB * be *ſuppoſed* ſo produced, though but one way; its length muſt be *ſuppoſed* to become *Infinite* (or *more than any Finite length aſſignable;*) For, if but *Finite*, a Finite production would ſerve. But, if ſo produced both ways; it will be yet *Greater*, that is, *Greater than that Infinite*, or Greater than was neceſſary to make it more than any Finite length aſsignable. (And whoever doth thus *ſuppoſe Infinites*; muſt conſequently *ſuppoſe, One Infinite greater than another.*) Again, when (by *Euclide's* tenth Propoſition) the ſame AB *, may be *Biſected* in M. and each of the halves in *m*, and ſo onwards, *Infinitely*: it is not his meaning (when ſuch continual ſection is propoſed) that it ſhould be *actually done*, (for, who can do it?) but that it be *ſuppoſed.* And upon ſuch (*ſuppoſed*) ſection *infinitely continued*, the parts muſt be (*ſuppoſed*) *infinitely many*; for no *Finite* number of parts would ſuffice for *Infinite* ſections. And if further, the ſame AB ſo divided, be *ſuppoſed* the ſide of a Triangle ABC *; and, from each point of diviſion, *ſuppoſed* lines (as mc, Mc, &c.) parallel to BC: theſe parallels (reckoning downward from A to BC) muſt conſequently be (*ſuppoſed*) *infinitely many*; and thoſe, in *Arithmetical progreſſion*, as 1, 2, 3, &c. each exceeding its Antecedent as much as that exceeds the next before it;) and, *whereof the laſt* (BC) *is given*: (and their Squares, as 1, 4, 9, &c. their Cubes, as 1, 8, 27, &c.) And this I ſay, to ſhew that the *ſuppoſition of Infinites* (with theſe attendants) is not ſo new, or ſo *Peculiar* to *Cavallerius* or Dr. *Wallis*, but that *Euclide* admits it, and all Mathematicians with him; as at leaſt *ſuppoſable*, whether *Poſſible* or not.

* See *Tab.* I. *n.* II.

* See *Tab.* I. *n.* III.

* See *Tab.* I. *n.* IV.

In particular, therefore, to his *Quære's*, I anſwer, 1. There may be *ſuppoſed* a row of Quantities *Infinitely many*, and *continually increaſing*, (as the ſuppoſed parallels in the Triangle ABC, reckoning downwards from A to BC,) *whereof the laſt* (BC) *is given.* 2. A Finite Quantity (as AB) may be *ſuppoſed* (by ſuch continual Biſections) diviſible into a number of parts *Infinitely many* (or,more than any Finite number aſſignable:) For there is no ſtint beyond which ſuch diviſion may not be *ſuppoſed* to be continued; (for ſtill the laſt, how ſmall ſoever, will have two halves,) And, all thoſe Parts *were in* the Undivided whole; (elſe,where ſhould they be had?) 3. Of *ſuppoſed* Infinites,one may be *ſuppoſed* greater than another: As a, *ſuppoſed*,infinite number of *Men*,may be *ſuppoſed* to have a *Greater* number of eyes. 4. A ſurface, or ſolid, may be *ſuppoſed* ſo conſtituted, as to be *Infinitely Long*, but *Finitely Great*, (the Breadth continually Decreaſing in greater proportion than the Length Increaſeth,) and ſo as to have *no Center of Gravity*. Such is *Toricellio's Solidum Hyperbolicum acutum*; and others innumerable,diſcovered by Dr.*Wallis*,Monſieur *Fermat*,and others. But to determine this,requires more of *Geometry and Logick* than Mr.*Hobs* is Maſter of. 5. There may be *ſuppoſed* a number *Infinite*; that is, greater than any aſſignable Finite: As the *ſuppoſed* number of parts, ariſing from a *ſuppoſed* Section *Infinitely continued* 6.There is therefore no reaſon,on this account, why the Doctrin of *Euclide*, *Cavallerius*, or Dr. *Wallis*, ſhould be rejected as of no uſe.

But having ſolved theſe *Quære's*, I have ſome for Mr. *Hobs* to anſwer, which will not ſo eaſily be diſpatched by him. For though *Suppoſed Infinites* will ſerve the Mathematicians well enough: yet, howſoever he pleaſe to prevaricate (which, he ſaith, is *for his Exerciſe*,) Mr. *Hobs* himſelf is more concerned than they,to ſolve ſuch *Quære's*. Let him ask himſelf therefore, if he be ſtill of opinion,that *there is no Argument in nature to prove, the World had a Beginning*: 1. Whether,in caſe it had not, there muſt not have paſſed an *Infinite number of years* before Mr. *Hobs* was born. (For,if but *Finite*,how many ſoever,it muſt have begun ſo many years before.) 2. Whether,now, there have not paſſed *more*; that is,*more than that infinite* number. 3. Whether, in that *Infinite* (or *more than infinite*) number of *Years*, there have not been a *Greater* number of *Days* and *Hours*: and, of which hitherto,*the laſt is given*. 4. Whether,if this be an Abſurdity, we have not then (contrary to what Mr. *Hobs* would perſwade us) an *Argument in nature* to prove,*the world had a beginning*. Nor are we beholden to Mr. *Hobs* for this Argument; for it was an Argument in uſe before Mr. *Hobs* was born. Nor can he ſerve himſelf (as the Mathematicians do) with *ſuppoſed Infinites*; For his Infinites, and more than Infinites of Years, Days, and Hours, *already paſt*, muſt be *Real Infinites*, and which have *actually exiſted*, and whereof the *laſt is given*; (and yet there are more to follow.) Mr. *Hobs* ſhall do well, (for his Exerciſe) to ſolve *theſe*, before he propoſe more *Quære's* of *Infinites*. And this I ſay, to ſhew that Mr. *Hobs* is, as much as any, concerned to ſolve the *Quære's* by himſelf propoſed.

In the latter part of his firſt Paper,

HE gives us (out of his *Roſet. Prop.* 5.) this Attempt of *Squaring the Circle. ſuppoſe* DT *be* $\frac{2}{5}$DC, *and* DR *a mean proportional between* DC *and* DT: *the Semidiameter* DC *will be equal to the Quadrantal Arc* RS, *and* DR *to* TV.

That the thing is falſe, is already ſhewed in the Latin Confutation of his *Roſetum*, publiſhed in the *Philoſophical Tranſactions* for *July* laſt paſt.

As it is now in the Engliſh; his Demonſtration is peccant in theſe words, (*Col.* 2. *lin.* 31, 32, 33.) *Therefore -- the Arc on* TV, *the Arc on* RS, *the Arc on* CA, *cannot be in continual proportion*; (with all that follows:) There being no ground for ſuch Conſequence.

And the thing is manifeſt *; for ſince that, by his conſtruction,
DC.CA.Arc on CA extended ∺ } are *in the ſame cantinual pro-*
DR.RS.Arc on RS extended ∺ } *portion, of the Semidiameter*
DT.TV.Arc on TV extended ∺ } *to the Quadrantal Arc*;

Let that proportion be *what you will*; ſuppoſe, as 1 to 2; and conſequently, DC to CA being as 1 to 2, it will be to the Arc on CA, as 1 to 4: And by the ſame reaſon, DR to the Arc on RS, and DT to the Arc on TV, muſt alſo be as 1 to 4: And therefore the Arcs on TV, on RS, on CA; that is, 4 DT, 4 DR, 4 DC; will be in the ſame proportion to one another, as (their ſingles) DT, DR, DC: But theſe (by conſtruction) are in continual proportion; therefore thoſe Arcs alſo, as they ought to be. Indeed, if (by changing ſome one of the terms) you deſtroy (contrary to the Hypotheſis) the continual proportion of DT, DR, DC, you will deſtroy that of the Arcs alſo (which are ſtill proportional to theſe:) but ſo long as DT, DR, DC, be in *any* continual proportion

* See *Tab.* 1. *n.* V.

portion (whether that by him aſsigned or any other) thoſe will be in the ſame continual proportion with them. As if for DT, DR, DC, be taken Dt, Dr, DC, in any continual proportion (greater, leſs, or equal to his) the Arcs on *tu*, on *rs*, on CA, (extended) will be in the ſame continual proportion.

But (which is the common fault of Mr. *Hobs's* Demonſtration) if this Demonſtration were good, it would ſerve as well for any proportion as that for which he brings it. For if, inſtead of $\frac{2}{5}$, he had ſaid, $\frac{4}{9}$, $\frac{1}{2}$, $\frac{1}{100}$, or what elſe he pleaſed; the Demonſtration had been juſt as good as now it is, without changing one ſyllable: That is, it will equally prove the proportion of the Semidiameter to the Quadrantal Arc, to be, *what you pleaſe*: As any may preſently ſee, who doth but read over his Paper.

In his ſecond Paper,

HE pretends to *confute a Theorem, which hath a long time paſſed for truth*; (and therefore doth no more concern Dr. *Wallis*, than other men.) And 'tis this, *The four ſides of a ſquare being divided into any number of equal parts, for example, into* 100; *and ſtreight lines drawn through the oppoſite points, which will divide the Squares into* 100 *leſſer Squares: The received opinion* (ſaith he) *and which* Dr. Wallis *commonly uſeth, is, that the Root of thoſe* 100, *namely* 10, *is the ſide of the whole Square.* Which to confute, he tells us, *The Root* 10 *is a number of Squares, whereof the whole contains* 100; *and therefore the Root of* 100 *Squares is* 10 *of thoſe Squares, and not the ſide of any Square; becauſe the ſide of a Square is not a Superficies, but a Line.*

For Anſ. I ſay, that 'tis neither the opinion of Doctor *Wallis*, nor (that I know) of any other (ſo far is it from being a *Received Opinion*, which Maſter *Hobs* inſinuates as ſuch) that 10 is the Root of 100 *Squares* (For ſurely a *Bare Number* cannot be the ſide of a *Square Figure*:) Nor yet (as Maſter *Hobs* would have it) that 10 *Squares* is the Root of 100 *Squares*: But that 10 *Lengths* is the Root of 100 *Squares*. 'Tis true that the *Number* 10 is the Root of the *Number* 100, but not, of a 100 *Squares*: and, that 10 *Squares* is the Root (not of 100 *Squares*, but) of 100 *Squared Squares*: Like as 10 *Douſen* is the Root, not of 100 *Douſen*, but of 100 *Douſen douſen*, or *Squares of a Douſen*. And, as, there,you muſt multiply not only 10 *into* 10,but *Douſen into Douſen*,to have the Square of 10 *Douſen*; ſo here 10 *into* 10 (which makes a 100) and *Length into Length* (which makes a *Square*) to obtain the Square of 10 *Lengths*, which is therefore 100 *Squares*, and 10 *Lengths* the Root or ſide of it. But, ſays he, the Root of 100 *Soldiers*, is 10 *Soldiers*. *Anſwer*. No ſuch matter: For 100 *Soldiers* is not the product of 10 *Soldiers into* 10 *Soldiers*, but of 10 *Soldiers into* the *Number* 10: And therefore neither 10, nor 10 *Soldiers*, the Root of it. So 10 *Lengths* into the *Number* 10, makes no Square, but 100 *Lengths*; but 10 *Lengths* into 10 *Lengths* makes (not 100 *Lengths*, but) 100 *Squares*.

So in all other proportions: As, if the number of *Lengths* in the *Square ſide* be 2; the number of *Squares* in the *Plain* will be *twice two*, (becauſe there will be *two* rows of *two* in a row:) If the number of *Lengths* in the *ſide*, be 3; the number of *Squares* in the *Plain*, will be 3 times 3, or the Square of 3: If that be 4, this will be 4 times 4: And ſo in all other proportions. Of which, if any one doubt he may believe his own eyes*.

* See *Tab.* I. *n.* VI. VII. VIII. IX.

And this Mr. *Hobs* might have been taught by the next Carpenter (that knows but how to meaſure a Foot of Board) who could have told him, that becauſe the *ſide* of a Square Foot, is 12 *Inches in* Length, the Plain of it will be 12 *times* 12 *Inches in Squares*: Becauſe there will be 12 Rows of 12 in a Row.

His third Paper,

WHich came out juſt as the Anſwer to the two former was going to the Preſs, contains, for ſubſtance, the ſame with his ſecond, and the Latter part of the firſt: And ſo needs no farther Anſwer.

Only I cannot but take notice of his uſual trade of contradicting himſelf. His ſecond Paper ſays, *The ſide of a Square is not a Superficies, but a Line*: His third ſays the quite contrary, (Prop. 1.) *A Square root, (ſpeaking of Quantity) is not a Line, but a Rectangle.* Other faults, falſities, and contradictions, there are a great many.

As for Inſtance: He tells us firſt, *In the natural Row of Numbers*, as 1, 2, 3, 4, 5, 6, &c. *every one is the Square of ſome number in the ſame Row*; (that is, of ſome Integer number;

which is notoriouſly falſe.) This he contradicts in the very next words, *But Square numbers (beginning at 1) intermit firſt two numbers, then four, then ſix, &c; ſo that none of the intermitted numbers is a Square number, nor hath any Square root.* (If theſe *intermitted numbers*, between 1, 4, 9, 16, &c. *be not Squares* how is it that *every one* in the whole row is a *Square*, and that of ſome Integer number?) But this again is contradicted *prop*. 2. where 200 (one of ſuch intermitted numbers) is made a *Square*, and $14\frac{4}{14}$ the *Root* of it.

Again; in his *Definition* he tells us, that *a Square Root multiplied into it ſelf produceth a Square:* But (*prop*. 2.) he multiplieth *the Root* $14\frac{4}{14}$ (not into it ſelf, but) into 14 (a part thereof,) to make 200, which he will have to be *the Square* of that Root. Nor is it a meer ſlip of negligence in the computation, but his Rule directs to it; *Any number given is produced by the greateſt Root multiplied into it ſelf, and into the remaining Fraction.* Whereof he gives this inſtance: *Let the number given be* 200 *Squares, the greateſt Root is* $14\frac{4}{14}$ *Squares* (he ſhould rather have ſaid *Lengths*; but that is a ſmall fault with him;) *I ſay, that* 200 *is equal to the product of* 14 *into it ſelf* (*which is* 196,) *together with* 14 *multiplied into* $\frac{4}{14}$ (*which is equal to* 4:) that is $14\frac{4}{14}$ multiplied into 14. But this calculation is again contradicted in his third propoſition, where he calculates *the ſame Square* otherwiſe, as we ſhall ſee by and by. In the mean time let's conſider this alone, and ſee the contradictions within it ſelf. His Rule bids us multiply *the greateſt Root into it ſelf*, &c. This *greateſt Root* he ſays is $14\frac{4}{14}$; yet doth he not multiply this, but 14 (a part thereof) *into it ſelf and into the Fraction* $\frac{4}{14}$. Again; if $14\frac{4}{14}$ be *the greateſt Root*, what ſhall be *the remaining Fraction*? Doth he take the Root of 200 to be more than $14\frac{4}{14}$ by ſome further *remaining Fraction*? If ſo, he ſhould have told us what that Fraction is; for $\frac{4}{14}$ it is not, this being part of his *greateſt Root* $14\frac{4}{14}$. But if we ſhould allow (as I think we muſt,) that by *the greateſt Root* he means ſometimes $14\frac{4}{14}$, ſometimes 14, (that is, if we allow him to contradict himſelf,) yet how comes he by the Fraction $\frac{4}{14}$? For, $\frac{2}{14}$ is too much (the ſquare of $14\frac{2}{14}$ being more then 200, as by multiplying $14\frac{2}{14}$ into it ſelf will appear;) which deſtroys his whole deſign; for 14, multiplied into $14\frac{2}{14}$, will not make 200, but 198; contrary to his rule. But further, it is ſo groſs a miſtake, to make 200 the Square of $14\frac{2}{14}$, that every Apprentice boy, (that can but multiply whole numbers, and fractions,) could have informed him better, who would firſt have reduced the fraction to ſmaller terms, putting $14\frac{2}{7}$ for $14\frac{4}{14}$, and then multiplying $14\frac{2}{7}$ into it ſelf, would have ſhew'd him, that the Square of $14\frac{4}{14}$, that is, $14\frac{4}{14}$ multiplied into it ſelf, is (not 200, but) $204\frac{4}{49}$.

But the Root of 200, is the ſaid number $10\sqrt{2}$, which is leſs than $14\frac{2}{14}$, and bigger than $14\frac{2}{15}$: the Square of that being ſomewhat more than 200; and, of this, ſomewhat leſs; but either of them within an unite of it.

But this ſecond Propoſition, is (as I ſaid) contradicted by his third, which makes the Square of $14\frac{4}{14}$ to be $200\frac{1}{49}$, (by what computation, we ſhall ſee by and by;) and then finds fault, that this and the former do not agree. (But 'tis no wonder they ſhould diſagree, when both are falſe.) *The ſame Square* (ſaith he) *calculated Geometrically, conſiſteth* (*by Euclid.* 2.4.) *of the ſame numeral great Square* 196, *and of two Rectangles under the greateſt ſide* 14 *and the Remainder of the ſide, and further of the Square of the leſs ſegment; which altogether make* $200\frac{1}{49}$. (He might have learned to reckon better; but let us ſee how he makes it out.) *As by the operation it ſelf* (ſaith he) *appeareth thus: The ſide of the greater ſegment is* $14\frac{4}{14}$ (this was, but now, the ſide of the whole ſquare, how comes it now to be but the ſide of the greater Segment?) *which multiplied unto it ſelf* (ſaith he) makes 200: (no; but $204\frac{4}{49}$:) *The product of* 14 *the greateſt Segment into the two Fractions* $\frac{4}{14}$ is 4, *and that added to* 196 *makes* 200: (if by two fractions $\frac{4}{14}$, he mean, as he ought by his Rule, the Fraction 4 twice taken, or the double of it, it will be not 4, but 8, and this added to 196 make 204; But all this he puts in his pocket, for it comes not into account at all.) *Laſtly, the product of* $\frac{2}{14}$ *into* $\frac{2}{14}$, *or* $\frac{1}{7}$ *into* $\frac{1}{7}$ *is* $\frac{1}{49}$; which with the firſt 200 makes $200\frac{1}{49}$: (But he forgets himſelf, for his leſſer ſegment was not $\frac{2}{14}$, but $\frac{4}{14}$; he ſhould therefore have ſaid $\frac{4}{14}$ into $\frac{4}{14}$, or $\frac{2}{7}$ *into* $\frac{2}{7}$, is $\frac{4}{49}$.) His calculation therefore ſhould have been this: The greater ſegment is (not $14\frac{1}{14}$, but) 14; which multiplied into it ſelf makes (not 200, but 196: The Rectangle of the greater ſegment 14, into the leſſer $\frac{4}{14}$, is 4: And this taken a ſecond time, is another 4: The leſſer ſegment (not $\frac{2}{14}$, but) $\frac{4}{14}$, or $\frac{2}{7}$, multiplied into it ſelf, is

$$\begin{array}{r} 14\frac{2}{7} \\ 14\frac{2}{7} \\ \hline 56 \\ 14 \\ 4 \\ 4 \\ \frac{4}{49} \\ \hline 204\frac{4}{49} \end{array}$$

(not $\frac{1}{49}$, but) $\frac{4}{49}$: All which added together make not $200\frac{1}{49}$, but $196+4+4+\frac{4}{49}=$) $204\frac{4}{49}$, which is juſt the ſame with $14\frac{4}{14}$ multiplied into it ſelf. So that, had he known how to multiply a number into a number, eſpecially when incumbred with fractions (which it is manifeſt he doth not,) he would have found no diſagreement between the *Arithmetical calculation*, and what he calls the *Geometrical*. But I am aſhamed (for him) that ſo great a pretender to ſuch high things in Geometry, ſhould be ſo miſerably ignorant of the common operations of practical Arithmetick.

His repeated Quadrature he now expreſſeth thus, *The Radius of a Circle is a mean Proportional between the Arc of a Quadrant and two fifths of the ſame.* But inſtead of *two fifths*, he might as well have ſaid the *half*, or *tenth*, or *hundredth part*, &c; or (taking T in DC produced beyond C,) the *double, decuple, centuple, &c.* or *what you pleaſe*: For his Demonſtration would have proved it, which is this. *Deſcribe a Square ABCD, and in it a Quadrant DCA. In the ſide DC* (continued if need be,) *take DT two fifths of DC,* (or its Half, Double, Hundredth part, or what you pleaſe;) *and between DC and DT a mean proportional DR; and deſcribe the Quadrantal Arcs RS, TV. I ſay, the Arc RS is equal to the ſtreight line DC. For ſeeing the proportion of DC to DT is duplicate of the proportion of DC to DR, it will be alſo duplicate of the Proportion of the Arc CA to the Arc RS, and likewiſe duplicate of the Proportion of the Arc RS to the Arc TV. Suppoſe ſome other Arc, leſs or greater than the Arc RS, to be equal to DC, as for example* rs; *Then the proprrtion of the Arc* rs *to the ſtreight line DT will be duplicate of the proportion of RS to TV, as DR to DT, which is abſurd; becauſe D*r *is by conſtruction greater or leſs than DR. Therefore the Arc RS is equal to the ſide DC; which was to be demonſtrated.* Which demonſtration therefore proving indifferently *every* proportion, doth not indeed prove *any*. In brief: The force of his Demonſtration is but this; *DT being to DC as 2 to 5* (or in any other proportion) *and DR a mean proportional between them; RS will be ſo between TV and CA; and therefore* rs *(greater or leſs than RS,) will not be a mean proportional between TV and CA*; which is true; *but why it may not be equal to DC*, we have nothing but his word for it; there being nothing to ſhew, that *DC is equal to ſuch a mean proportional.* Again; though *rs* be not a mean proportional between TV and CA, yet it may be between *tv* and CA, which ſerves his Demonſtration as well;

which

which is indifferent to any three continual proportionals, as was ſhewed before. So that now we have had three Demonſtrations of this Quadrature, (in his *Roſetum*, in his *firſt* paper, and in his *third*,) and this common fault in all of them, that they equally prove the proportion by him propoſed, or any other what you pleaſe. But ſuch his Demonſtrations uſe to be.

And this is what I thought fit to ſay to Mr. *Hobs*'s *Four Papers* (rather to ſatisfie the importunity of others, than becauſe I thought them worth Anſwering:) And ſubmit the whole, with all Reſpects, to the *Royal Society*, to whom Mr. *Hobs* makes his Appeal.

His Fourth Paper;

WHich came out ſince the *Three former* were anſwer'd, (containing ſome faint endeavors to re-aſſert ſome things in them,) is but meer Trifling, or worſe than ſo.

What he would therein inſinuate concerning *God* (that we may as well prove *Him* to have had a Beginning, as that the World had) ſmells too rank of Mr. *Hobs*. We are not to meaſure Gods *Permanent* Duration of Eternity, by our *ſucceſſive* Duration of Time: Nor, his Intire *Ubiquity*, by Corporeal *Extenſion*.

What in it concerns *Mathematicks*, (whether his own or others,) is ſo weak and trivial, (and ſaid only, that he may ſeem to ſay ſomething, though nothing to the purpſe,) that I ſhall truſt it with thoſe to whom he makes his appeal, without thinking it to need any Reply; The view of what he writeth againſt, being a ſufficient Anſwer to all he ſaith.

New Obſervations of Spots *in the* Sun; *made at the Royal Academy of* Paris, *the* 11, 12 *and* 13*th of* Auguſt 1671; *and Engliſh't out of the French, as follows.*

IT is now about twenty * years ſince, that Aſtronomers have not ſeen any conſiderable *Spots* in the Sun, though before that time, ſince the Invention of Teleſcopes, they have from time to time obſerved them. The Sun appeared all that while with an entire brightneſs, and Signor *Caſſini* ſaw him ſo the *ninth* of this month of *Auguſt*.

---

* *See* Numb. 74. *p.* 2216; *whence it will appear, that ſome ſuch Spots were ſeen here in* London, *A.* 1660. *And Monſ.* Picard *affirm'd to Dr.* Fogelius *at* Hamburg, *that he had ſeen ſome in* October 1661. *witneſs the ſaid* Doctor's *own Letter, written to the Publiſher* Auguſt 11th *laſt.*

But the *Eleventh* of the ſame, about ſix a clock at night, being furniſht only with a three-foot glaſs, he remarked in the Sun's diſque *Two Spots* very dark, diſtant from his apparent Center about the third part of his Semi-diameter. And that he might the more exactly note their ſcituation, in reſpect of the ſeveral parts of the world, he made uſe of two very fine threds, cutting one another at right angles in the common *focus* of the two glaſſes and in the *Axis* of the Teleſcope: And having directed it toward the Sun, he ſo turn'd it, that letting it afterwards reſt, one might ſee the Center of the Sun, according to one of theſe threds, advance Weſtward, this ſame thred marking in the Sun a Circle parallel to the *Equator*; and the other thred marked the *Circle* of *Declination*; or the *Horary Circle* of the ſaid Sun. See *Tab*. II. *Fig*. I.

Then he obſerv'd, that the Spots were in the Southern part of the Sun; that their elongation from this parallel, paſſing through his Center, could be no more than about the *Sixtieth* part of his Diameter; and that they were ſcituate on the Eaſtern ſide in reſpect of the ſaid Center of the Sun. He alſo meaſur'd ſeveral times, from ſix a clock at night to ſeven, the time, which lapſed between the paſſage of the Sun's center, and that of the firſt of theſe Spots through the ſaid *horary Circle*, which ſometimes he found to be twenty three, ſometimes twenty two *ſeconds*, the ſemi-diameter of the Sun then paſſing in ſixty ſix ſeconds.

The firſt of theſe Spots, being look'd upon with a Teleſcope of ſeventeen foot long, appear'd of a ſomewhat Oval figure; the other was oblong and a little curv'd, like the Hebrew letter *Jod*; and both together were ſurrounded by a *corolla* or coronet made up of little dark points, which conformed it ſelf to the figure of the Spots, conſidered as they were joyned together: which coronet was more exactly obſerved the days following.

The *twelfth* of *Auguſt* he obſerv'd them from the time of Sun-riſing, and perceived that now they were nearer his Center. The time between the paſſage of the Suns center, and that of the interior edge of the Coronet which encompaſs'd them both, was then of ſixteen ſeconds. At ſeven a clock it was but of fifteen, and the Southern limb of the Coronet touched the parallel paſſing through the Sun's center.

He continued exactly to obſerve them with a great Teleſcope, from ſix a clock in the morning to ſeven, and found them to be there, as they are repreſented in the II *Figure* of *Tab.* 2. The firſt was compoſed of two others almoſt round, and conjoyned. The ſecond repreſented the ſhape of a Scorpion. The third was round. And they were all three environ'd with a Coronet, which was compos'd, as we ſaid above, of abundance of little obſcure pricks. This Coronet appear'd to be clearer than the reſt of the Sun when look'd upon with the ſhort Glaſs, and darker when ſeen with the long. Without it there were other points, but very black ones; *viz.* five near the round Spot on the South-ſide, and another near the Scorpion's tail on the North-ſide.

At Eight a clock and fourty eight minuts, the figure of the Scorpion was ſeen divided into ſeveral pieces, as if his tail and arms had been cut off; repreſented in the III *Figure* of *Tab.* 2. The Northern point appear'd no more, there remaining none but thoſe on the South ſide; and the length of the encloſure of all the Spots, comprehended between the extremities, was of one minut and fifteen ſeconds, and the breadth of thirty ſeconds.

The ſame *twelfth* day, at ſix in the evening, he found no great change in the firſt Spot. The other two were ſever'd into five diſtinct ones, compaſs'd about with a Coronet, as appears in the IV *Figure* of *Tab.* 2. Together with five black points, which ſtood in a ſtreight row, and after another manner than they did in the morning. From ſix at night unto ſeven, the time between the paſſage of the Sun's center, and that of the Coronets limb, was found to be, one time, of *eight* ſeconds, and another time of *ſeven ſeconds* and an *half*. The diſtance of the Spots unto the parallel, paſſing through the Sun's center, was near the ſame on the North-ſide with what it had been obſerved to be in the morning on the South-ſide.

The *thirteenth* of *Auguſt*, between the Riſing of the Sun and half an hour paſt ſix in the morning, the Spots ſtood as is ſeen in the V *Figure* of *Tab.* 2; the edge of the Coronet, being turn'd to a point on the South-ſide, was diſtant from the *Equator*, on the North-ſide, half a minut; and there was but a ſecond of time from the paſſage of the Suns Center into the paſſage of the ſame anterior edge of the Coronet.

At eight a clock thirty minuts, the fore-edge was in the ſame *horary Circle* with the Center of the Sun: So that in one day and an half theſe Spots have run through very near the *third* part of the Sun's apparent ſemi-diameter, which giveth an Arc of nineteen degrees and an half of the Circumference of the Sun's Body; and conſequently their Diurnal motion about the Sun's *Axe* hath been of *thirteen* degrees; and the time of their Periodical revolution, as far as we could conjecture in ſo little time, muſt be about *twenty ſeven days* and *an half*: Which yet will be more exactly determined by Obſervations of a longer time. Mean while thoſe that have been made, give us hopes to ſee them yet ſix or ſeven days longer, if they diſ-appear not before they arrive to the Sun's limb.

We thought it not amiſs to advertiſe thoſe, that are addicted to Celeſtial Obſervations, of the Diſcovery of theſe *Phænomena*, that they may alſo obſerve the ſame; and if they be not furniſh't with great Teleſcopes, they ought not therefore to be diverted from it, ſince we have found, that by a glaſs of one foot theſe Spots may be ſeen, at leaſt as making but one ſpot. But it will be particularly neceſſary, to obſerve with care from about the fourth unto the eighteenth of the month of *September* next, (ſt.n.) whether theſe Spots, after they have paſſed over the Upper Hemi-ſpere of the Sun which is hid from us, will not return and be ſeen again in its apparent diſque.

So far the French Academiſts. To which we now add; 1. That ſince their Obſervations were made publick, we had notice ſent us from the above-mention'd Dr. *Fogelius* reſiding at *Hamburg*, (as we touched in the foregoing Tract,) that Mr. *Picard* had obſerv'd at Sea a Spot in the Sun from the third of *Auguſt* (ſt.n.) to the nineteenth of the ſame incluſively; and ſeen it, at the firſt, like the Tayl of a Scorpion; but on the nineteenth day reſembling a Melon-ſeed. 2. That ſeveral curious Obſervers at *London* have ſeen one of thoſe Spots recurr'd to the Sun's Eaſtern limb, on the ſame day that Signor *Caſſini* predicted in the Relation above-deliver'd they ſhould return, if they continued: The particulars of whoſe Obſervations, if they come to hand, we may give an account of hereafter.

A Conſiderable

A Conſiderable Accompt touching Vegetable Excreſcencies, *given by that Learned and Obſerving Gentleman, Mr.* Martin Liſter, *in a Letter to the Publiſher, of* July 17. 1671. *from* York.

I Underſtand by yours of the 23*th* inſtant, that M. *Ray* cannot without much trouble retrieve the Letter, wherein I gave him formerly my opinion concerning *Vegetable Excreſcencies*; and yet not wholly to deny you the ſatisfaction of what you ſeem much to deſire, I am willing to think again upon the ſame ſubject, at leaſt to recollect part of my former thoughts, as my memory will ſerve me.

The occaſion then of that Letter was upon the account given us by You in *Numb.* 57, of the opinion of the Italian *F. Redi*; *Viz.* that ſome live Plants or their Excreſcencies do truly generate ſome Inſects. To which opinion of *F. Redi* I told my friend, as I remember, that I indeed had obſerved, that the By-fruits of ſome Vegetables, as of the *Oak* and *wild Roſe*, for example, did grow up together with their reſpective worms in them from ſmall beginnings to fair and large fruit, ſome of them emulating even the genuin off-ſpring of the plant,

——— *& miratur non ſua poma.*

And further, that I did believe, the worms were furniſhed with food in and from them; but not by any Navil-connexion, as that Author fancies, and which I ſaid, to me was unintelligible, and that I ſhould be glad of a notion, which might make out to me ſuch monſtrous relation, as half animal half vegetable, or which is all one, Vegetable veſſels inſerted into an animal, or, the contrary. Strange Oeconomy!

That it had never been my good fortune (what ever diligence I had uſed) to diſcern Eggs in the Center of *Galls*, but a worm conſtantly, even at the very firſt appearance, as near at leaſt as my fortune led me. Yet I would not deny, but that diligence might one day diſcover the egg it ſelf, which I was of opinion was affixed to or near the place by the parent-Inſect, where the Gall roſe.

That I ever found the worms in all the excreſcencies, that I had yet met with, perfectly at liberty; and for the filaments, our Author mentions, it was very poſſible he might be miſtaken, it being very hard, and a matter not yet treated of in any publick paper, which and what are the veſſels that enter into the Texture of a Vegetable, as of a large Tree, for example; much more hard would it be to ſay, this is a veſſel in a ſmall Gall. That there were many By-fruits of different figure and ſhape (though perhaps of a like Texture) upon one and the ſame plant, every one of which did nouriſh and produce a different race of Inſects: Whence, I told him, I thought might rather be argued the diverſe workmanſhip of different Inſects, then one and the ſame principle of vegetation to be Author of ſeveral ſorts of Animals.

That the Animals themſelves, produced of ſuch Excreſcencies, were for the kind of ſuch a race, as were well known to us to be otherwiſe generated of animal parents, and therefore it was probable, that theſe were ſo too, as well as their tribe-fellows.

That the Inſect-Animals produced of ſuch Excreſcencies were male and female; and that, if ſo, we might argue with *Ariſtotle* (lib. 1. c. 1. *de Generat. Animal.*) that Nature made not ſuch in vain, and that, if from the coit of theſe Animals, which have their birth from no Animals, Animals ſhould be born, they would *either* be like their parents and of the ſame ſpecies with them, and if ſo, it would neceſſarily follow (ſince in the generation of all other creatures it ſo comes to paſs) that their very parents had ſuch origin too: *or* unlike them, and if ſo (if theſe alſo were male and female) of this ſecond unlike off-ſpring a third race of different animals or *ſpecies* would be begot, and of them a fourth, and ſo *in infinitum.* And that theſe Inſects, which he and I had obſerved to be produced of the Excreſcencies of ſome vegetables, we had good cauſe to ſuſpect they were male and female, ſince ſome of them had ſtings and were tripilous, and others not (*vide Catalog. plant. Cantab. ad Roſam caninam & alibi.*)

Theſe were ſome at leaſt of the Arguments, as far as I remember, I uſed, when I formerly wrote on this ſubject to my friend; but ſince that Letter, I have peruſed the Book of *F. Redi* it ſelf, and do find, that the ſaid opinion is barely propoſed as a thing not unplauſible, but the proofs thereof are reſerved, till the publiſhing of a curious piece, concerning the *Excreſcencies* of the *Oak*; and therefore I ſhall be leſs earneſt in the refutation of that opinion, which perhaps a more accurate ſearch into Nature will in time make the Author of it himſelf find erroneous.

I preſume not to venture to decide this controverſy, my experience in theſe matters being too inſufficient, and my leiſure and health but little to haſten a convenient ſtock of particulars, and a due examination of them; yet before I leave this ſubject, I am willing to run over and preſent you with a few abbreviated inſtances of ſome of the ſeveral kinds of Vegetable Excreſcencies, and likewiſe ſome un-obvious ways of Inſects feeding on plants; and theſe I ſhall deliver in confirmation of the following Propoſitions.

1. That all are not truly Vegetable Excreſcencies that are reputed ſuch. And here we may juſtly name the *Purple-Kermes*, for example, whoſe hiſtory you were pleaſed to publiſh in *Numb.* 73. This, I ſay, both gives a clear light to the diſcovery of the nature of the *Scarlet-Kermes*, (a thing wholly unknown to the Ancients, as far as we can ſee by their writings, and no leſs ignored by the moderns, and yet, which is admirable, in very great eſteem and continued in uſe for ſome thouſands of years,) and alſo is an evident inſtance, that ſome things, confidently believed Vegetable Excreſcencies, are no ſuch matter, but Artificial things meerly contiguous to the plant, and which have no other relation to it than the *patella*-ſhellfiſh to the Rock it cleaves.

2. Generally, Inſect Eggs laid upon the leaves of plants, or their reſpective worms feeding on them do not occaſion or raiſe Excreſcencies. This truth every body, that hath been the leaſt curious, is an Eye-witneſs of. Thus, for example, the Eggs of the common *Red butter-fly*, laid upon the Nettle, are thereon hatched without bliſtering the plant into an Excreſcence, and the ſtiff haired or prickly *Caterpillars* hatched from them Eggs, feed upon the leaves without any ill impreſſion, puncture, or prejudice, ſave that they make clean work, and eat all before them. I could produce ſome hundreds of inſtances, if this were to be doubted of.

3. Some Inſect-eggs, laid upon the leaves or other parts of plants, do, as ſoon as hatched, pierce and enter within the

plant to feed. To give you a convincing inſtance to the truth of this propoſition, take this from my notes.

May 22, I obſerved on the back or underſide of the leaves of *Atriplex olida*, certain ſmall milk-white oblong Eggs, on ſome leaves four, on others fewer, or more; theſe Eggs were on ſome plants yet unhatched, but on many of the ſame plants I found the Egg-ſhells or skins yet adhering to the leaves, and the little maggots already entered (through I know not what inviſible holes) within the two membranes of the leaf, and feeding on the inward pulp or ſubſtance of the leaf: in other leaves of that plant, (he that ſhall make the obſervation after me, will find plants enough of this *ſpecies* ſeized on, to vary, as I did, the obſervation in one day,) I found thoſe maggots grown very great, and yet the two membranes, that is, the uppermoſt and undermoſt skin of the leaf, entire, but raiſed and hollow like a blather. Note 1. That thoſe magots were of a Conick ſhape. 2. That in *July* they ſhrunk into *Fly Chryſalis*'s, and accordingly came to perfection, &c. To this unobvious way of feeding we think we may refer all worm-eaten fruits, woods, &c.

4. Worms feeding within ſome of the parts of ſome plants do cauſe Excreſcencies. Thus the heads or ſeed-veſſels of *Papaver. Spart. Sylv. Ger. Emac.* &c. are disfigured for having worms in them, and grow thrice as big, as the not ſeaſed ones. This is alſo plain in the Excreſc. of *Pſeudo teucrium*, and *Barbarea*, &c.

5. The ſubſtance of moſt Vegetable Excreſcencies is not the food of the worms to be found in them. The inſtances given in confirmation of the laſt propoſition do alſo confirm this: neither is an *Oak-apple* properly worm-eaten, or the *Shagged Galls*, or *Sponges* of the *Wild Roſe*, or the *Smooth* ones on the leaves of the ſame plant, or the Baggs upon the leaves of the *yellow dwarf-Willow* or the *Elm*, &c.

This is the ſum of what I have to ſay at preſent concerning this ſubject, being very unwilling to advance further, than my own private obſervations will ſuffer me.

An Accompt of ſome Books.

I. *Lectiones* 18, Cantabrigiæ *in Scholis publicis habitæ, in quibus OPTICORUM Phænomenων Genuinæ rationes inveſtigantur & exponuntur, ab* Iſaaco Barrow, *Coll. S.* Trin. *Socio, Matheſ. Profeſſ.* Lucaſiano, & Soc. Regiæ *Sodali.* Londini, 1669. *in* 4°. *Impenſis* Joh. Dunſmore *ad Inſigne Roſæ & Coronæ, in Cæmeterio D.* Pauli.

A Brief ſummary of theſe *Optick Lectures* the Excellent Author doth himſelf deliver in an Epiſtle to a Friend, who deſired ſuch an one from him; when he ſaith, that in them he endeavoureth to promote that part of *Opticks*, which he undertakes to treat upon, firſt by explaining and eſtabliſhing its Principles; then by deriving from them ſome uſeful Conſectaries, ſerving to the explication of the *Phænomena*: in the mean while attempting to correct ſome common errours, and to ſupply ſome principal defects therein.

Towards theſe purpoſes, he firſt examineth the received *Hypotheſes* of this Science, ſhewing, how they ſhould be underſtood, and how far admitted; aſſigning alſo ſome *Phyſical* cauſes of them, (in the performance whereof he declares himſelf not to confide much, but only requires the *Hypotheſes* themſelves, as not diſagreeable to Reaſon, and very congruous to Experience, to be admitted.)

Having firſt ſetled the *Hypotheſes*, he firſt draweth from them ſome general Corollaries, partly before acknowledged by others, and partly obſerved by himſelf; all confirmed by his own demonſtrations.

Then proceeding to more Special matters, he proſecutes diſtinctly *Catoptricks* and *Dioptricks*, both *Plain* and *Spherical*. And ſlightly paſſing over *Plain Catoptricks* (as eaſy and commonly treated on, truly enough,) he more largely inſiſts upon *Spherical Catoptricks*, propounding ſuch Theorems, whereby the Interſections, and the Limits of Reflected rays are declared, and together the Appearing places, or images of points radiating both from a great (and, as it were, immenſe) diſtance, and from a diſtance ſenſibly near, are determined, both in reſpect of an eye placed *in* the Axis of the radiation, and in reſpect to one placed *without* that Axis any where; the which particulars he had not obſerved in any Book extant to be truly and diligently handled.

Then he from the foundation raiſeth a *Theory* concerning both *Plain* and *Spherical Dioptricks*, aſſuming for a ground that rule concerning the Meaſure of Refractions, which Mr. *Des-Cartes* firſt diſcovered, and which now moſt of the beſt writers do admit, and which he judgeth agreeable to truth (for that all deductions from it very well ſuit to experience) which yet he knows not that any writers have applyed to this purpoſe, ſo as to have raiſed any competent ſuperſtructure thereon. And here orderly (firſt in reſpect to *Plain*, then to *Spherical Surfaces*,) conſidering points radiating from a diſtance ſo great that their rays may be ſuppoſed to fall parallel to one another upon the refracting ſurface, he propounds ſome *Theorems*, from which the chief Symptoms of refracted rays do reſult; their Interjections and Limits are eaſily diſcernable; the appearing places or images of ſuch points are defined, both in regard to an eye ſituated *in* the Axis of the radiation, and in regard to one placed *elſewhere*. Then he proſecutes in like manner the ſame things in reſpect to *Points*, radiating from a diſtance ſenſibly finite or near.

And that the *Uſe* of theſe things may be more ready, and ſerviceable to practiſe, he ſubjoyneth diſtinctly and particularly the determinations of the places in the Axis of the Images of points however radiating through each kind of *lentes*.

Having diſpatched theſe matters, he toucheth generally concerning the making a judgment about the Appearances of Magnitudes (as to their ſcituation and figure,) which follow thoſe ſorts of reflection and refraction: Afterward more ſpecially and copiouſly, he ſhews what kind of Images plain objects do yeild from ſuch reflections, and how they may be delineated.

Among theſe things there are interſperſed ſome conſiderations about divers incident matters; as about the nature of Light, and the cauſes of different Colours about the Rainbow, or colours appearing in pellucid globes; about ſome appearances in the vitreous *Priſme*; concerning the *linea refractaria*, concerning the reſolution of problems by Appropriate lines; concerning the properties of the *Conical* ſections in the reflection of lucid rays, &c.

II. *Lectiones* 13. *GEOMETRICÆ, in quibus* (*præſertim*) *Generalia LINEARUM CURVARUM Symptomata declarantur ab eodem* Iſaaco Barrow, *&c. Impenſis ejuſdem Bibliopolæ, in* 4°.

COncerning the *Geometrical Lectures*, arguing great depth in the Mathematical Learning,

In the *firſt* of them, in order to what follows afterward concerning the *Generation of Magnitudes*, the Deſerving Author treateth about the Nature of *Time*, as it may be conſidered in Mathematical ſuppoſitions about ſuch Generations.

In the *ſecond* are declared the Mathematical *Hypotheſes* about ſimple Motions (progreſſive and Circular,) which ſerve to the Production of Magnitudes, together with ſome general remarks, about the natures, dimenſions, and properties (conſequent on ſuch productions) of Magnitudes. There is alſo a touch about the Method of *Indiviſibles*, explicating, how in ſome caſes it is to be underſtood and applyed.

The *third* treats about the Generation of Magnitudes by compoſition and concourſe of motions.

In the *fourth* and *fifth*, from one generation propounded of Curve lines, (ſuppoſing them produced by two motions, one uniform, the other accelerated) divers Theorems are inferr'd, implying ſo many general properties of Curve lines.

The next *five* Lectures do contain many Theorems, and Problems about readily determining the *Tangents* of *Curve* Lines, immediatly by them, without other computation; particularly, there are divers ſingle Theorems, whereby the Tangents of all Curves commonly known or conſidered in Geometry (the *Conical Sections*, *Conchoids*, *Ciſſoids*, *Spirals*, *Quadratrices*, &c.) are determined in ways ſo general, as to comprehend alſo the like determination of Tangents in regard to innumerable other Curves, generated in a common manner with them. Of thoſe five Lectures the two firſt are *Lemmatical*, or preparatory to the Demonſtration of the propoſitions delivered in the other three; wherein yet there be ſome *Theorems* not unpleaſant. In the *tenth* is delivered a general Analytical method of determining Tangents, extending to all ſorts of Curve lines, both *Geometrical* and *Mechanical* (as Monſieur *Des-Cartes* diſtinguiſheth.)

The *eleventh* Lecture containeth ſeveral general Theorems, about the Dimenſion of Magnitudes, or the compariſon of them with one another.

To that there is ſubjoyned an *Appendix* concerning the dimenſion of Circular, and Hyperbolical ſegments, with divers Theorems and Rules ſerving to that purpoſe.

The *twelfth* Lecture containeth alſo ſeveral Theorems concerning the Dimenſion of Magnitudes, but chiefly reſpecting the dimenſion of Surfaces produced by the Rotation of Curve lines, and the dimenſion of Curve lines themſelves.

To this Lecture there are alſo three Additaments; the *firſt* whereof containeth ſome Theorems about the dimenſions of Spaces conſtituted by the Tangents and Secants of a Circle. The *ſecond* ſhews, how the foregoing Theorems may be demonſtrated by the Apagogick way, or by reduction *ad abſurdum*; together with a way of finding the dimenſion of the ſurfaces of Conical bodies. In the *third* divers Problems and Theorems are added, of kin to thoſe of the *eleventh* and *twelfth* Lecture.

The *thirteenth* Lecture propounds an Explication of the nature, and conſtitution of Equations, together with the variety of Roots, their Limits, &c. by conſtruction, and conſideration of certain curve lines appropriate to each Equation: with ſome notes reſpecting each particularly, and all in general.

So much of theſe two Excellent Treatiſes: Since the Publication of which, their worthy Author hath been pleaſed to communicate to a Friend of his ſome Corollaries, belonging to the ſecond *Problem* of his third *Appendix* to the twelfth *Lecture*; which becauſe we conceive they will be very acceptable to the Mathematical Reader, we ſhall here, by the Author's good leave, ſubjoyn them in the ſame Language, he hath written them in, *viz.*

Cæterum, ἐπιμέτρου *vice, animadverto, potuiſſe ſecundo Appendiculæ tertiæ Lection's XII. Problemati Corollaria quædam adponi non injucunda; qualium adſcribam unum & alterum.*

V. Tab. 1. n. X.

Probl. 1. *Detur linea quæpiam AMB (cujus axis AD, baſis DB,) curva ANE deſignetur talis, ut ductâ libere rectâ MNG ad BD parallela, quæ ipſam ANE ſecet in N; ſit curva AN æqualis ipſi GM.*

Curva ANE talis ſit, ut ſi MT curvam AMB; & NS curvam ANE tongant, ſit SG. GN : TG. $\surd GMq - TGq$; *ipſa ANE propoſito faciet ſatis.*

Probl. 2. *Iiſdem quoad cætera ſuppoſitis, & conſtitutis; curva ANE*

ANE jam talis eſſe debeat, ut curva AN ſemper æquetur interceptæ rectæ NM.

Curva ANE jam talis ſit, ut ſit $SG.\ GN :: 2TG \times GM.\ GMq - ſGq$ *; erit ANE curva, quæ deſideratur. V.* fig. eandem.

Probl. 3. *Datur curva quæpiam DXX, cujus axis DA; reperiatur* V. Tab. 1. n. XI. *curva AMB proprietate talis, ut ſi libere ducatur recta GXM ad ipſam AD perpendicularis, ponaturque, SMT curvam AM tangere; ſit MS æqualis ipſi GX.*

Liquet rationem TG ad TM (hoc eſt, rationem GD ad MS, vel GX,) dari; adeoque rationem TG ad GM quoque dari.

Inſervit hoc ſuperficiebus deſignandis, quarum in promptu ſit dimenſio. Etenim (ductâ ME ad AD parallelâ) ſuperficies Solidi, ex Plani BME circa axem DB rotatu progeniti, adæquat $\frac{\text{Periph.}}{\text{Rad.}} GDX$*; ut habetur in II^a Lectionis XII.*

In Lect. XI. Appendice, numero 33, de Cycloide *profertur Theorema quoddam; id quod ex hujuſmodi generaliori Theoremate deduci potuiſſet.*

Sit AMB curva quælibet, cujus axis AD, baſis DB; ſit item curva V. Tab. 1. n. XII. *ANE talis, ut ſi arbitrariè ducatur PMN ad DBE parallela, poſitóque, rectam TN curvam ANE tangere, ſit TN parallela ſubtenſæ AM; completo rectangulo ADEG, erit ſpatium trilineum AEG æquale ſegmento ADB.*

Huic ſuppar theorema tale eſt: Iiſdem poſitis; ſi tam ſegmentum ADB, quàm ſpatium AEG circa axem convertantur; erit productum è ſegmento ADB ſolidum producti ex AEG duplum. V. fig. eand.

E Tangentium *porrò contemplatione ſuborta eſt methodus, per quam expeditiſſime plurima circa maximas quantitates Theoremata deducuntur; quæ certè, ſi tempeſtivè ſe objeciſſent, digna cenſuiſſem quæ* Lectionibus *insererentur: ex iis indigitabo nonnulla.*

Sit curva quæpiam ALB, cujus axis AD, baſis DB, & huic parallelæ V. Tab. 1. n. XIII. LG, $\lambda\gamma$ *; item LT curvam tangat:*

Theor. 1. *Sit* m *numerus quicunque* poteſtates *exponens; ſi ponatur* $DG^{m-1} \times TG = GL^{m}$*; erit* $DG^{m} + GL^{m}$ *maximum, ſeu majus quàm* $D\gamma^{m} + \gamma\lambda^{m}$.

Th. 2. *Itidem ſumpto numero* m, *ſi ponatur* $BL^{m-1} \times TL = GL^{m}$*; erit* $GL^{m} + BL^{m}$ *maximum, ſeu majus quàm* $\gamma\lambda^{m} + B\lambda^{m}$.

Th. 3. *Sint numeri quilibet* m, n*; ſi ponatur* $m \times TG = n \times DG$*, erit* $DG^{m} \times GL^{n}$ *maximum, ſeu majus quàm* $D\gamma^{m} \times \gamma\lambda^{n}$.

Th. 4. *Quòd ſi ponatur* $m \times TL = n \times \text{arc}\ BL$*, erit* $GL^{n} \times BL^{m}$ *maximum, ſeu majus quàm* $\gamma\lambda^{n} \times B\lambda^{m}$.

Th. 5. *Si fuerit* $TG \bar{\times} GL = DGLB$, *erit* $DGLB \bar{\times} GL$ *maximum, ſeu majus quàm* $D\gamma\lambda B \times \gamma\lambda$.

Th. 6. *Sin* $TG \times GL = 2\,DGLB$; *erit* $GL \times \sqrt{DGLB}$ *maximum, ſeu majus quàm* $\gamma\lambda \times \sqrt{D\gamma\lambda B}$.

Haud difficili negotio cùm hæc demonſtrantur, tum ejuſmodi complura deprehenduntur.

III. *A Continuation of the* MEMOIRES *of M.* Bernier *concerning the Empire of the G.* Mogol. *Engliſh't out of French.* London, *Printed for* Moſes Pitt *in Little Brittain*, 1671. *in* 8o.

THe *firſt* Volume of theſe *Memoires*, lately alſo printed in *Engliſh* for the ſame Bookſeller, containing almoſt nothing but *political* affairs, was left un-mention'd in theſe Books; but this *ſecond* taking notice of many particulars, relating to our deſign, we thought good to give it ſome place here; and to let the Reader know, that, beſides an accurate Deſcription of the two famous Cities of Indoſtan, *Dehli* and *Agra*, and many things diſcovering the *Genius* of the *Mogols* and *Indians*, as alſo thoſe, which belong to their *militia*, &c. here is an account given,

Firſt, of the Extravagant opinions of the Gentiles of *Indoſtan*; of their odd belief concerning *Eclipſes*; of the Books of Sciences received amongſt them; of their Doctrine of the Tranſmigration of Souls, and of the Creation, Preſervation and Deſtruction of the World; as alſo a Relation of the different Sects of Philoſophers amongſt them; of their Method of *Phyſick*, very different from ours, and how ſucceſsful; of their ignorance in, and averſion from *Anatomy*; of their pleaſant Tenets in *Aſtronomy*, *Geography*, and *Chronology*; of their opinion concerning *Plants* and *Animals*, importing that the Seeds of both of theſe kinds are not form'd anew, but were contrived in the Firſt production of the World; as alſo, that they are actually the very entire Plant or Animal.

Secondly, here is to be found a good deſcription of the kingdom of *Kachemire*, the reputed *Paradiſe* of the Eaſt-Indies; its antient State; its preſent condition and excellencies for Soyl, Vegetables, Waters, Cattel, Wild Dear; the wit and Induſtry of the Inhabitants in making fine ſtuffs, good Verniſh, &c. the condition of its Mountains, one ſide of them being intolerably hot, and yielding *Indian* Plants, the other very tolerable, and affording none but *European* Plants; ſome remarkables about the Generation and Corruption of Trees there; ſtrange *Caſcata's* of water; a rare fountain, flowing, and ſtopping regularly thrice a day, at a certain time of the year, and at other times flowing irregularly; and a great Lake, having Ice in Summer, &c. The Scituation of the kingdoms of *Tibet*, and the Commodities they offord. A conſiderable account of Voyages made by Caravans from *Kathemire* through the mountains of the great *Tibet* into *Tartary* and *Cataja*; and another, of the kingdom of *Kacheguer*, with directions how to travel thither from *Kachemire*, as alſo, how to paſs from *Kacheguer* to *Cataja*. To all which is added an Anſwer to ſome Queſtions touching the *Mounſons* and *Rains* in *India*; the wonderful regularity of the Current of the Sea, and of the Winds there; the fertility of *Bengale*; and the Cauſes of the Inundation of the *Nile* and ſome other Rivers. The whole is concluded with a Letter concerning the Doctrine of *Atoms* and the nature of the *Mind* of Man.

Hiſtoria & Meteorologia INCENDII ÆTNÆI. *Anni* 1669. Joh. Alph. Borelli. *Regio Julio* 1670. *in* 4°.

THough we have ſeen ſeveral Relations communicated to us of this late fire Fire of Mount *Ætna*, one of which hath been inſerted in *Numb.* 51. of thoſe Tracts; yet will it be eaſily allow'd by thoſe, that ſhall have read and conſidered this Diſcourſe, compoſed and publiſhed by the famous Philoſopher and Mathematician *J. Alph. Borelli*, that all others, that have hitherto written any thing about it, muſt needs give the preemince to him in reſpect of method, fulneſs, and philoſophical reflexions; to the performance of which he averreth to have been induced by his Eminence the Cardinal *de Medicis* and the Engliſh *R. Society*.

The Author then having given a ſhort *Topography* of this Mountain, delivers firſt a ſuccinct Relation both of the old and later Eruptions; as alſo of this laſt Fire of *Ætna*, and withall aſſigneth the *perpendicular* Height of the ſame, ſhewing it not to exceed three *Italian* miles; and here taking notice of *Kepler's* aſſigning two ſuch miles for the height of the Atmoſphere, and thence concluding the top of *Ætna* to be conſiderably raiſed above that region of the common Air; confirming the ſame by a known Experience, whereby thoſe that are on the ſaid top at a clear break of day, may plainly ſee the whole Iſland of *Sicily*, and all the Towns thereof, as 'twere elevated and hanging in the Air, near the Eye, juſt as, upon the account of Refraction, ſtones lying at the bottom of a pond appear nigh the ſurface of the water.

After this, in the Hiſtory it ſelf of this Eruption he deſcribeth particularly;

Firſt, the beginning of it, which happen'd on the 8th of *March* 1669, accompanied with Earth-quakes, and a Rent of the ground of 12 miles long, and 5 or 6 foot broad, as alſo with a terrible noiſe, roaring and cracking, vaſt globes of ſmoak firſt riſing into the Air, and abundance of fiery melted ſtones being ejected ſoon after, which firſt ran like a flood of fire, and overwhelmed in a ſhort ſpace of time 13 towns, beſides a part of the City of *Catania* it ſelf, and afterwards were by the Air hardned into vaſt heaps of black and pumice-like ſtones, there call'd *Sciarra*; waſting and ſpoiling abundance of Vines, Olives, and other plants.

The caſting out of the Aſhes and Sand continued for three whole months without ceaſing, and filled all the neighbouring country, and cover'd all the Trees thereof for 15 miles about; the ſmalleſt duſt flying even over Sea into *Calabria* by a South-wind, and into the moſt Southern-parts of *Sicily* by a North-wind.

But then on the 25th of *March*, by a new Earth-quake the Top or Turret of Mount *Ætna* it ſelf fell in, whereby was made an Opening or Cauldron of three miles in compaſs, and vaſt quantities of new matter caſt out, and amongſt it, abundance of fiery ſand, falling down with a yet burning heat at 8 miles diſtance from the Cauldron; whereupon the ſame by particular view and obſervation was found widen'd to the circumference of 6 miles. Mean while all conſidering men there were amaz'd at the force throwing out to ſo great a height ſuch huge ſtones, whereof one was meaſur'd to be 60 palmes (or about 40 foot) long, which was faln down a mile from the Cauldron with that violence, that it was ſtruck 30 palmes into the ground.

When this fiery Torrent aſſaulted *Catania* it ſelf, and had already by its impetuoſity forced from its place a whole hillock, planted with vines, belonging to the *Jeſuits*, and carryed them floating,together with the ſoil bearing them, till it ſo ſwelled as to cover and ſink them all; there appear'd ſome gallant perſons, who by their ingenuity and extraordinrry diligence,with fit Inſtruments, and raiſing vaſt ſtrong walls, diverted the courſe of the fiery ſtream from that City,but chiefly by boaring through the ſtony heaps, and thereby making paſſage for that current another way,and turning part of it into the Sea,wherein it made a promontory of a mile's compaſs before the Town.

It ceaſed by the 11th of *July* of the ſame year it began: And in *May* of 1670. our Author himſelf could handle without hurt the inner parts of the Cauldron and the former Torrent, and ſaw not ſo much as any ſmoak remaining in the higheſt part of that opening: Where yet he obſerveth,that notwithwanding this entire ceaſing in the ſaid places, there were yet found in ſeveral parts of this newly ejected *Sciarra* hot and ſtrong-ſmelling fumes ariſing on high, eſpecially near the walls of the South-ſide of *Catania*, where wells had been digged for watering their Garden fields.

This being the Breviat of the Hiſtory of this Eruption, which the Author deſcribeth with many other conſiderable circumſtances; we proceed to acquaint the Reader, that after this Deſcription he expatiateth into divers important ſpeculations and remarks thereupon.

And *firſt* he comments upon the Form,Conſiſtence,Bulk,and Motion of the ejected matter; taking particular notice of the great abundance of *Sal Armoniac*,that was found in all the holes and vents of the ground, and in the clefts of ſtones; and obſerving, that in three months time the fiery flood ran out 12 miles in length,and,taking the *medium*, one mile and two thirds of a mile in breadth, and ſtopp'd at laſt by the ceaſing of new matter,and the condenſation of the liquid matter by the cooling Air.

Next, he compareth together the meaſure of the freſhly ejected matter with that of the Mountain, and finds it to equal near a fourteen thouſand part of the whole Mount.

Thirdly, he evinceth, that Mount Ætna hath no ſuch vaſt deep cavities, as ſome imagine, within its bowels near the ſurface of the Sea,but that there it is filled up with ſolid and ſtony matter,the huge weight of the ſuperincumbent hill rather compreſſing it,than ſuffering any conſiderable hollowneſſes to continue therein.

Fourthly, having exploded the imperfect *Meteorology*, deliver'd by the Antients of this Mountain, he diſcourſeth of Subterraneous Heat, and deduceth the Cauſe of it from ſome concrete oleaginous and fatty ſubſtances, as ſulphur, bitumen, and oyl, eaſily reducible into flame; examining withall, both what is the origin of ſuch ſulphureous and bituminous matter, and how that comes to take flame: Where he digreſſeth to ſhew, how Gunpowder is ſet on fire, after he hath deſcribed the compoſition, and conſidered the ſtupendious force of the ſame by its percuſſion.

Fifthly, he declareth, how and why the Fire in this Mountain was kindled; which he conceiveth to have been moſt probably done by ſuch a way, as Quick-lime is heated by the affuſion of Water; whereupon he ſheweth, how Earth-quakes, Flames, and Conflagrations may have enſued.

Sixthly, he examins the origin and production of the fluid matter that was vitrified upon its being thrown out of this Mountain; and is of opinion (which he aſſerts by reaſon and experiment) that it was not any ignited and melted Sulphur or Brimſtone, or both together, nor any metallin bodies that were converted into thoſe vaſt ſtony and black maſſes, which they call *Sciarra's*, but rather Earth and Sand, together with ſome Alcaliſat Salts, burn'd by the fervent heat of the *Ætnean* furnaces, and ſo turn'd into a vitreous fluor, and afterwards, upon their being cool'd by the Air, into hard ſubſtances: Explaining withall, how the Aſperity and Opacity of theſe ſtones are conſiſtent with this ſentiment.

Seventhly, he diſcourſeth plauſibly of the Extent, Form and Scite of the *Ætnean* Furnace, and having, upon the examination of divers circumſtances, found it but ſmall and narrow, he labours to ſhew, how, this notwithſtanding, ſo vaſt a quantity of matter, as amounts, according to his eſtimate, to about 100, 000, 000 cubic paces, could be therein melted and thence caſt up.

Eightly, he deſcribeth the burning down and falling in of the higheſt top of *Ætna*.

Ninthly, he inquireth into the Generation of thoſe *Sands* abovementioned, and withall giveth an account, why in the New opening of *Ætna* there were heard ſuch terrible and perpetual Thundering noiſes, as alſo, by what cauſe and force thoſe Sands were thrown out; ſhewing withall, that they were really *Sands*, not *Aſhes*, and ſolving Objections alledged againſt it.

Tenthly he concludeth, that ſince, by his calculation, the upper part of Mount *Ætna* hath been juſt ſo much depreſſed, as the maſs of ſand and ſtones ejected amounts to, this maſs was furniſh't by the Mountain it ſelf, and from the Earth and Sands thereof produced and vitrified: where he taketh pains to make it appear, how all that prodigious quantity of matter, thrown out both now and in former ages, and ſeeming far to exceed the bulk of this whole Mountain, could be furniſh't by *Ætna* it ſelf, and yet the ſame not be quite levelled with the ground: The like of which he conſiders of Mount *Veſuvius*.

Eleventhly, he taketh particular notice, that, whereas the Fires were ſoon extinguiſh't in the place of the very Pit of the Sulphur and Bitumen, yet they laſted long in other places, that were wateriſh and deſtitute of combuſtible fatneſs; endeavouring to render a reaſon of this *phænomenon*.

Twelfthly, he inſerts an Obſervation of great plenty of *Sal Armoniac*, caſt out in this *Incendium*, which, he ſaith, was ſeen adhering both to the corners and aſperities of the *Sciarra*, and to the ſides of the rents made in thoſe huge ſtones, which the ejected matter was at length hardned into. And of this Salt he affirms, that there had been ſublimed, (for he makes it *factitious*) ſo great ſtore, that many thouſands of pounds might be gather'd; adding, that even a whole year after the extinction of the Fire in the Mouth's of *Ætna*, there were found remaining divers vents about *Catania*, exhaling ſtore of ſmoak, which had the like Sal Armoniac ſticking to the ſides and edges of the Stones.

Laſtly, he rejecteth the opinion of thoſe, that will maintain the Ætnean Fires to have been perpetual and never extinguiſh'd, aſſerting the frequent ceſſation of them, and withall aſſigning the cauſe of that ceſſation, as well as that of their renovation. Concerning which, and many other conſiderable remarks and reflections, too many to be here recited, we refer the Reader to the Book it ſelf.

An Advertiſement neceſſary to be given to the Readers of the Latin *Verſion, made by Mr.* Sterpin *at* Copenhagen, *of the* Philoſophical Tranſactions *of A.*1669; *printed at* Franckfurt *on the* Main *by* Dan. Pauli, *A.*1671.

This Advertiſement relating chiefly to Forrain Readers, it was thought more proper to deliver it in *Latin*, than *Engliſh*; viz.

C*VM nuper incideret* Tranſactionum, *ut vocant*, Philoſophicarum *Author Anglicus in earum Verſionem, quæ A.*1669. *ſermone Anglico editæ fuerant, deprehenderètque innumera inibi occurrere, tam à Scriptoris ſenſu, quàm à Latini ſermonis genio, nec non ab ipſo Decoro nimiùm abludentia, utique cobibere ſe non potuit, quin extraneum imprimis Lectorem moneret, quam maximè ab hac Verſione ipſi eſſe cavendum.*

Ne autem gratis hoc dici Lector candidus exiſtimet, pauca ex per-multis in verſione dicta commiſſis erroribus & vitiis enormibus ſpecimina hîc ſiſtam, ut exinde judicare quilibet de cæteris poſſit.

Principiò, Indecorum omninò videri poſſit, Titulum illum Anglicum, qui primariæ Nobilitatis Viris, tam Eccleſiaſticis quàm Secularibus, apud *Anglos* debetur, vocibus My Lord and your Lordſhip expreſſus, Latinè ab hoc Traductore reddi vocabulis, *Mi Domine, &, Dominatio tua*; quod familare præ ſe fert alloquium paris ad parem. Id verò in Verſione *Dedicationis*, Reverendiſſimo Epiſcopo *Salisburienſi* adſcriptæ, perquàm inſulſè factum.

Deinde, Verſionis hujus initium perperam ibi factum, ubi Reſponſiones habentur ad complura *Quæſita*, nec tamen *Quæſita* illa in parte Latinè verſa comparent.

Inſuper, operarum Typographicarum Corrector complura peſſimè punctata, in veri ſenſûs fraudem, & immane Lectoris tædium, dimiſit,

Adhæc ne inſiſtam recenſendis innumeris dictionibus planè ineptis, quales ſunt *primo* in Dedicatione; *ſcintillis vitam dare*, pro, *ſcintillas ſuſcitare*; it. *apparitiones*, pro, *phænomena*; it. *diſtantia*, pro, *diſcrimen*; it. *rectam lineam ſtrictiùs ſequi*, pro, *ſemitam rectam oculis irretortis calcare*; Deinde, in ipſo Opere, ut, *p.*4. *l.*12. *ſtirpes majoris famæ*, pro, *celebriores*; it. *p.*5. *l.*22. *in contemptum plurium medicaminum*, pro, *multis medicaminibus nequicquam adhibitis*; it. *p.*6. *l.*13. *ſucci acervo*, pro, *ſucci penu*, *p.*9. *l.*5. *vividum arboris incipere cernere licet*, pro, *arborem exerere vigorem ſuum videbis*. *p.*13. *l.*10. *corroſionem*, pro, *decorticationem*. *p.*17. *l.*24 *pericula*, pro, *experimenta*. *p.*19. *l.*17. *hi tractatus*, pro, *hæ pagellæ*. ib *l* 23. *conferentiâ*, pro, *colloquio*. *p.*20. *l.*12. *merſor*, pro, *urinator*. ib. *l.*15 *meum ſpiritum exire inhibui*, pro, *habitum meum inhibui*. ib. *l.*21. *camphoræ ſimilans*, pro, *caphuram referens*. ib. *l.* 22. *alembico opertis*, pro, *in alembico diſtillatis*. *p.*22. *l.*1. *ſi quid vobis in oculis cadat, occæcabimini*, pro, *ſi quid fortè oculis illabatur, cæcitatem inducet*. ib. *l.*23. *comitata fuerunt*, paſſivè poſuit, cùm pueri norint eſſe deponens. *p.* 22. *l.*15. *ut præcipitat*, pro, *præcipitet*. *p* 32. *l.*17. *complectuntur*, poſuit paſſivè, cùm ſit deponens; obvia erant verba, *comprehenduntur*, *continentur*. *p.*34 *l.*20. *ut poteſt*, pro, *poſſit* ib. *l.*23. *de quo ſui ipſius verba vobis reſpondebimus*, pro, *cui ipſiuſmet verbis ita reſpondemus*. *p.*36. *l.*13. *ſublevat*, pro, *ſolvit*. *p.*38. *l.* 24. *additionis, ſubtractionis* pro, *additionem, ſubtractionem*. *p.* 39. *l.*3. *rectis lineis figurarum*, pro, *figurarum rectilinearum*. ib *l.*21. *ſuis habitantibus*, pro, *ipſius incolis*. *p.*40 *l.*14. *largitudo*, pro, *amplitudo*. *p.*41 *l.*6. *oculo in uno polorum conſtante*, pro, *oculo poſito in uno polorum*. ib. *l.*15. *coluræ*, pro, *coluri*.

coluri.ib.*l*.18.*circuli*,pro,*circulorum*.p.42.*meram mutationem committens*, pro, *admiſſâ duntaxat mutatione*.*p*.48.*l*.5.*Joh.Wallem methodum agnoſcentem ac utentem*,pro,*Joh.Walliſium*,*methodum agnoſcentem*,*eaque utentem*.*p*.49.*l*.14. *excuſſum* pro,*excuſum*.*p*.52.*l*.15.*theorematis* 3, pro,*theoremata tria exhibet*,*oſtendens proportionem*,&c.

Sed, inquam, ne his & Sexcentis aliis (modeſtè loquor) ſolæciſmis & barbariſmis immorer,pergo notare pauciſſima ex innumeris, quæ ſenſum ipſum vel perturbant vel omninò convellunt; idque duntaxat in *Num. primo* hujus Verſionis; qualia ſunt: Pag.5.*l*.23.*omne*,*gummi applicato pruni*, *in aceto diſſoluto*; ſenſus eſt,*malum omne*,*prunorum applicato gummi*,*eoq*;*in aceto diſſoluto*,*ſanatum fuit*.*p*.10.*l*.10.*magis*,pro,*diutius*. *p*.11.*l* 14,15. *æquinoctium*, pro,*Solſtitium*.ib.*l*. 19.*in punctis ligni circuli*,ſenſus eſt,*in punctatis trunci circulis p*.12.*l*.26.poſt voc.*involucri*,omiſſa ſunt verba,*uſque ad ipſiſſimum lignum ſolidum p*.13.*l*.4.poſt voc.*cortice*, omiſſum,*circumcirca*. *p*.14.*l*.8. *viſco*, pro, *tilia*.ib.*l*.25.*aſcendentem*,pro,*deſcendentem*.ead.lin.*vel carmen pulpamve*, pro, *pulpam vel tegmen*.*p*.15.*l*.21.*ſcindendo exiguum vimen recens natum*, *medullæ in aliquib. ramulis*,*&* *per hoc aliis ejuſdem magnitudinis*; ſenſus eſt,*in nuce obſervatio inſtitui poteſt*, *tenellos quoſdam ramulos ad ipſam uſque medullam ſecando*, *nonnullos verò alios*,*ejuſdem magnitudinis per medullam ipſam tranſadigendo*.ib.l. ult.*alius quantitati*,pro,*alterius*.*p*.17.*l*.1.& 9.*fraxinus*,pro,*populus alba*: *Anglicum* Aſh & Aſpe idem ſonabant noſtro Traductori.p.22.l.3. accepit adjectivum theeving pro nomine proprio, quod reddendum erat, *prædatrix*. *p*.29.*l*.16,17.lege, *à ſe &* *altero illo mathematico coram dicta Soc. factis confirmaverit*; ſenſus alioqui non apparet.*p*.36.*l*.5.*eadem Eclipſis*,pro,*ejuſmodi*. *p* 37.*l*.21.*Letwardum*,pro,*Sethum Wardum*. *p*.39.*l*.22. *libris*, pro,*infantibus*. *p*.49.*l*.26.*aliquâ*,pro, *quavis*. *p*.50.*l*.13. *cujus altit. eſt peripheria*, *vel à centro ejus gravitate deſcripta*; ſenſus eſt,*Cujus altit.eſt peripheria à gravitatis ipſius centro deſcripta*.*p*.51.*l*.14.*prominentiam*,pro,*ungulam*.ib.*l*.17.*ſpiram*, pro,*fuſum*. ib.*l*.18.*axem*,pro,*baſin*.ib.*l*. 19.*eſſe ſicut baſin eſt ad* $\frac{16}{15}$ *axis*,pro,*ſicut baſis parabolæ eſt ad* $\frac{16}{15}$ *axis*. ib. *l*.20. *parabolam æqualem habere proportionem circulo circa ſuam baſin ut diametro*,*deſcripto*,*ac parabolæ ejuſdem circuli axis circumferentiæ habet*,*cujus rad.æqualis eſt centro gravitatis ab axi ſemi-parabolæ*: Quis mortalium ex his verbis ſenſum exſculperet, qui in Anglico huc redit; *Prop*.29 *tradit author*,*parabolam*,*eam habere proportionem ad circulum deſcriptum circa baſin ceu diametrum*, *quam habet axis parabolæ ad circumferentiam circuli*, *cujus radius æqualis eſt diſtantiæ centri gravitatis ſemi-parabolæ ab axe*. *p*. 52. l.12.*eminentias*, pro,*ungulas*. ib.l.17. *inquirendo*,pro,*requirendo*.

Piget omninò,plura conſectari; finem quippe vix invenirem: Ea enim, quæ diſpunxi, menda & vitia nonniſi pauca ſunt ex permultis ſolius *Numeri* 1.Devorare hoc tædium cogebar,ut conſtaret Lectori,quid de Verſione tota eſſet expectandũ.Si ipſe forſan interpres ſtricturas haſce in malam partem accipiat,memorem eum eſſe velim dicti: *Quicquid cogit*,*excuſat*.

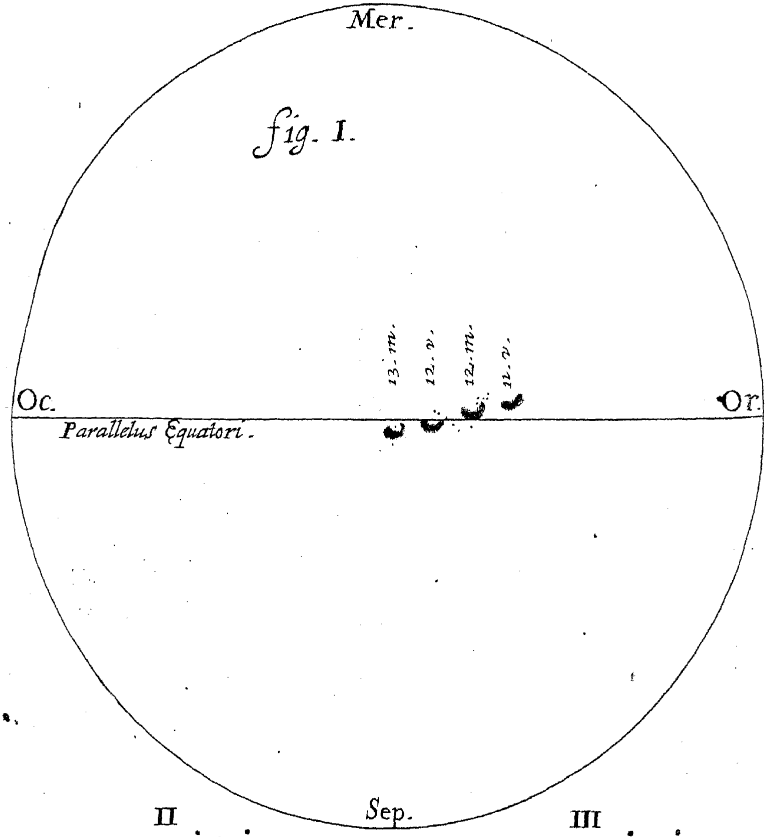
Inſpecto dehinc N°. 45, ubi deſcribitur inſtrumentum Opticum Dn. *Wrenni*,nec non Obſervatio Saturni facta à D.*Hugenio* & D.*Picardo*, verſionem utriuſque argumenti per-ridiculam deprehendi,*&c*.

ERRATA in this number. *P*.2248.*l*.7.*r*.fu'd *for* ſaid. *ib*.*l*.29.*r*.the Fraction $\frac{-4}{14}$ twice. *p*. 2249. *l*. 2. *r*.204,$\frac{-4}{47}$ which. *p*.2250.*l*.7.*r*. three *for* four. *p*. 2260. *l*.5.*del*.the.

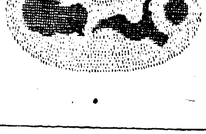
London, Printed for *J. Martyn*, Printer to the Royal Society. 1671.

Maculę in Sole die 11. 12. et 13 Augusti 1671.

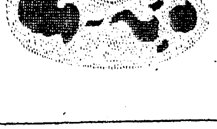
fig. I.



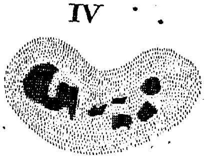
II



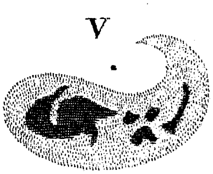
III



IV



V



PHILOSOPHICAL TRANSACTIONS.

Octob. 22, 1671.

The CONTENTS.

Obſervations made by ſeveral Aſtronomers, domeſtic and forrain, of the late Eclipſe *of the* Moon *on Septemb.* 8. *An Account of the Diſſection of a* Porpeſs, *by Mr.* Ray, *noting ſome omiſſions of* Rondeletius *on this ſubject. Three Letters; the* firſt *of Mr.* Willughby, *concerning the* Ichneumon-waſps, *and their ſeveral ſtrange ways of Breeding, eſpecially that of laying their Eggs in the Bodies of Caterpillars,*&c. *The* ſecond *of Mr.* Liſter, *confirming ſome former Obſervations about* Musk-ſented Inſects, *and adding ſome Notes upon M.* Steno's *late Book touching* Petrified Shells. *The* third *of the ſame, enlarging his former Communications about* Vegetable Excreſcencies *and* Ichneumon-Worms.

An Account of Four Books: I. Joh. Walliſii *S. Th. D. Tractatus de MOTU Pars Tertia.* II. Dan. Ludovici *M.D. de PHARMACIA moderno ſeculo applicanda Diſſertationes Tres.* III. *Joh. Bapt.* Sylvatici *Inſtitutio MEDICA de iis qui MORBUM SIMULANT deprehendendis.* IV. *Quadripartitum BOTANICUM* Simonis Pauli *M.D.*

Rrr *Obſervations,*

Obſervations, made by ſeveral Aſtronomers, domeſtic and forrain, of the late Eclipſe of the Moon, *on Septemb. 8. 1671; here delivered in the Languages, in which they were Communicated.*

1. THat of Mr. *Street* was this, in *London.*

	Time by Altitudes corr. by parall. and refract.			
	°	'	h.	'
The *Emerſion*: Altit. of the upper edge of the ☾	10	30		21
The *End* of the Eclipſe: Alt. of *Arcturus* —	16	20	8	16½

By my Tables (*ſaith he*) of *Aſtronomia Carolina*;

	T. app. h.	'	"
The Beginning at	4	50	8
Immerſion	5	47	44
Middle	6	34	55
Emerſion	7	22	6
End	8	19	42

2. Ann. 1671, d. 8. Sept. *circa horam ſextam veſpert. Luna aſcendebat totaliter obſcurata ſub Elevat. Poli* 50°. 15'. *Ectoniæ in Comitatu Northamptoniano* Angliæ. *

* *Cœpit emergere ex Umbra, centro Lunæ alto* 9°. 35', *ſive hor.* 7. 18'.

Finis, Arcturo alto 16°. 30', *ſive ho.* 8. 16'. 20": *Unde computatur Medium Eclipſis fuiſſe hor.* 6. 28'. 16".

* Obſervante Doctiſſimo Dn. *Palmero*, teſte Dn. De *Bellieres*, Gallo, præſente cùm Obſervatio hæc perageretur.

3. The Learn'd *Bullialdus* communicated from *Paris*, about this Eclipſe, the following Obſervations; which, by his favour, we ſubjoyn thus;

Ex Epilogiſmo Calculi Eclipſis Lunæ, quæ facta eſt d. 18 *Septembris ſt. nov. ex Tab. Philolaicis;*

Datur

Datur Uraniburgi T. A.				*Pariſiis.*				*Latit*		
	h.	'	''		h.					
Initium	5	50	29	*Init.*	5	10	29	*Initio*	1	13
Total. obſc.	6	50	29	*Tot. obſc.*	6	10	29	*Fine*	12	48
Max. obſc.	7	40	18	*Max. obſc.*	7	0	18			
Vera ☍	7	41	22	*Vera* ☍	7	1	22			
Emerſio	8	30	7	*Emerſio*	7	50	7			
Finis	9	30	7	*Finis*	8	50	7			

Obſervatus eſt Pariſiis			
Finis, alto Arcturo ad Occaſum	13	41	''
Ablatâ refractione, alto	13	37	45
	h.		
Hinc datur finis obſervatus	8	29	16
	g.		
Finis Penumbræ alto Arcturo	13	0	
Correct.	12	56	
	h.		
Unde datur	8	33	40
Cœlum ergo anticipavit Tabularum calculum		20	51
Heckerus *in Ephemeridibus ponit finem* ex Rudolphinis,	h.	'	''
Uraniburgi T. A.	9	37	7
Fuiſſet Pariſiis	8	57	7
	g.		
Cœlum ergo anticipavit Calc. Rudolph.	0	0	27
	h.		
Obſervata eſt Mæotis *tota extra Umbram*	8	24	16
	g.		
Alto Arcturo	14	26	0
Correct.	14	23	55

Exivit Luna ex umbra è regione Petræ Sogdianæ Hevelii.

Ex Epilogiſmo juxta Tab. Britannicas Clariſſimi Viri Vincent. Wingi,

Datur Londini T. A.				Pariſiis *fuiſſet.*		
	h.	'	''	H.		
Initium	4	56	49	5	4	49
Total. obſc.	5	56	32	6	4	32
Max. obſc.	6	46	0	6	54	0
Vera ☍	6	46	58	6	54	58
Emerſio	7	35	28	7	43	28
Finis	8	35	11	8	43	11

Tabulæ Britannicæ anticipant Cœlum 13' 55''.

Luna Oriens tota ſub Umbra fuit, nec nubibus obſtantibus videri potuit. Intra nubes ſubinde viſa eſt tota ſub umbra, antequam ex hac emergeret.

So far Monſieur *Bullialdus*. Hoping, there will ſhortly come to hand the Obſervations, touching the ſame Eclipſe, of ſome other Aſtronomers both Engliſh, and Forrainers, and theſe of *Paris*, *Uraniburg*, *Dantzick*, &c. we ſhall not fail, God permitting, to publiſh them hereafter.

An Account of the Diſſection of a Porpeſs, *promiſed Numb.* 74; *made, and communicated in a Letter of Sept.* 12. 1671, *by the Learned Mr.* John Ray, *having therein obſerv'd ſome things omitted by* Rondeletius.

SIR,

ABout the later end of *April* 1669, being at Weſtcheſter with my Lord Biſhop of that Dioceſs, in the company of *Fr. Willughby* Eſq; I had the good fortune to meet with a young *Porpeſs* of a convenient ſize for Diſſection; brought thither by ſome Fiſhermen, who caught him upon the Sands, where the Tide had left him; in the Anatomy whereof I obſerved ſome things omitted by *Rondeletius* in his Deſcription of the *Dolphin*.

The length of this was by meaſure 3 feet and 7 inches. A ſtring of 2 feet and 2 inches girded him in the thickeſt place. The ſhape of his body was not much unlike that of a *Tunny fiſh*; only his ſnout longer and ſharper. His skin was thin, ſmooth, and without ſcales. In an old and well-grown fiſh its like the skin may be thick and tough, as *Rondeletius* repreſents it.

His Fins are cartilagineous, and flexible, not ſharp or prickly, as the Ancients report them. On his back he hath only one, which was diſtant from the tip of his ſnout 1 foot and 9 inches; and the baſis of it in length 5½ inches; ſo that meaſuring from the tip of his ſnout to the end of the tayl, it was ſcituate ſomewhat below the middle of the fiſhes length. On the Belly it had only one pair of fins, 9½ inches diſtant from the tip of the lower mandible, much about the place, where the foremoſt pair of fins in other fiſhes uſually grow. The Tayl is forked, of the figure of a Creſcent; the breadth thereof from angle to angle 11 inches. The *ſitus* or poſition of it contrary to that of all other fiſhes, except thoſe of this kind. For, whereas the plain of the tayl of other fiſhes, when they ſwim, ſtands erected perpendicularly to the plain of the Horizon, in this fiſh (and I ſuppoſe in all others of the *Cetaceous* kind) it lyes parallel thereto. The reaſon whereof I conceive to be *partly* to ſupply the uſe of the hindmoſt pair of fins in other fiſhes, which ſerve to ballance the body, and keep it up in the water, anſwering in proportion to the hinder legs of a Quadruped; hence we ſee, that thoſe fiſhes, which have long bodies and but one pair of fins, as Eeles and the like, cannot keep themſelves up in the water, but lye always grovelling on the bottom: *partly*, to facilitate the fiſhes aſcent to the top of the water (to which he can immediately raiſe himſelf by a light jerk of his tayl thus placed) for the uſe of reſpiration, which is neceſſary for him, as for Quadrupeds. For, doubtleſs if violently deteined under water, he would in a ſhort time be ſuffocated or drowned.

Immediately under the skin lay the fat, which, as I remember, our Seamen call the *Blubber*: It was firm, full of fibres, and in this ſmall fiſh, of an inch thickneſs, encompaſſing and encloſing the whole body, back, belly and ſides. The uſe whereof I conceive to be, 1. to keep the cold water at a diſtance from the bloud, which is, I believe, actually and to the touch hot, in a degree not much inferiour to that of Quadrupeds, and therefore by immediate contact of the water would be apt to be chilled. 2. To keep in the hot ſteams of the bloud from evaporating; by that means alſo preſerving and maintaining its natural heat: as we ſee water, and any other liquour in a cloſe veſſel will retain its heat much longer than in an open; and nothing is more proper to detain the fineſt and ſubtilleſt evaporations and ſpirits, than oyl or fat. 3. Perhaps alſo, to lighten or counterpoiſe the body of the fiſh, which would otherwiſe be too heavy to move and ſwim in the water. Under the Blubber lay the Muſculous fleſh like to that of Quadrupeds, but of a darker colour.

The Body was divided into three Regions or *Ventres* like a Quadrupeds, *viz.* Head, Breaſt, and Belly; the veſſels and *viſcera* in each *venter*, for the main, the ſame as in Quadrupeds: 1. The Abdomen was compaſſed about with a ſtrong *Peritonæum*. The Guts joyned to the Meſentery, and of a very great length, by meaſure 48 foot, without any difference or diſtinction of great and ſmall; neither was there any Blind-gut, or Appendix, that I could find. The Stomach was of a ſtrange make, being divided into two large bags, beſide other ſmaller ones. I found nothing in it, but a good number of thoſe little long fiſhes, which our Fiſher-men dig out of the Sands at low-water, and therefore call in ſome places Sand-Eeles; by ſome they are called *Launces*, and by Geſner, *Ammodytæ*.

The Liver was of a moderate ſize, ſcituate in the right ſide, and divided into two lobes, having no *cyſtis fellea* or receptable of Gall annexed. The *Pancreas* large, ſticking cloſe to the third bag of the Stomach, into which alſo its *ductus* enters, and emptys it ſelf. The Spleen ſmall and roundiſh. The Kidneys larg, ſticking cloſe to the back, and lying contiguous one to the other, made up of many little kernels, like to, but much leſſer than, thoſe of an Ox; of a flat figure, having no *pelvis* in the middle, but the Ureters going out at the lower end.

The Urin bladder oblong, and little for the bulk of the Animal, having on each ſide a round ligament, made of the umbilical arteries degenerating. The *Penis* long, ſlender, having a ſmall ſharp *Glans*; it appears not outwardly, but lies hid in its ſheath within the body, doubled up or rather reflected in the form of the letter S, as is that of a Bull. The Teſticles lye within the cavity of the *Abdomen* on each ſide, as they do in an Hedg-hog, and ſome other Quadrupeds, of an oblong figure; for their internal ſubſtance, Seminal veſſels both *præparantia & deferentia*, *Epididymides*, *Vas pyramidale*, *Corpus varicoſum*, & *glandulæ proſtatæ*, exactly like to thoſe of Quadrupeds. The Seminal veſſels perforate the *Urethra* with many little holes, whereof four are moſt conſpicuous ſomewhat above the neck of the bladder.

The Diaphragm was muſculous, as in Quadrup. The Heart large, included in a *Pericardium*, had its two Ventricles; its *valvulæ Sigmoides ſemilunares*, *tricuſpides & mitrales*; its coronary arteries and veins: in a word, the whole ſtructure and ſubſtance of the heart and lungs agreed exactly with that of Quadrupeds. The Windpipe was very ſhort, as it muſt needs be, the fiſh having no neck; the *Larynx* at top was of a ſingular figure, running out with a long neck, and a nob at the end like an old faſhioned Ewer.

The pipe in the Head, through which this kind of fiſh draw their breath, and ſpout out water, lies before the brain, and ends outwardly in one common hole, but inwardly its divided by a bony *ſeptum*; as it were into two noſtrils; but below again it opens into the mouth in one hole. This lower orifice is furniſhed with a ſtrong *Sphincter*, whereby it may be ſhut and opened at pleaſure, and above this *Sphincter*, the ſides of the pipe are lined with a glandulous fleſh, which if you preſs, you ſhall ſee ſtart, out of many little holes or *papillæ* into the cavity of the pipe, a certain glutinous liquor. Above the noſtrils is a ſtrong valve or membrane like an *Epiglottis*, which ſerves to ſtop the pipe, that no water get in there againſt the fiſhes will. Within the *fiſtula* are ſix blind holes having no out-let; four tending toward the ſnout; two above the valve that ſtops the noſtrils; and two beneath it; two tending towards the brain, having a long but narrow cavity for the uſe of ſmelling, as I conjecture, though opening the brain I could find neither olfactory nerves nor *proceſſus mammillares*. The Eyes are ſmall conſidering the bigneſs of the fiſh, and ſcituate at a good diſtance from the baſis of the brain. The Snout is long, and furniſhed with very large muſcles, to root or turn up the ſand at the bottom of the Sea for to find fiſhes, as appears in that we found nothing in his ſtomach but Sand-Eeles, which, as was intimated before, lye buried in the Sand. The Brain and *Cerebellum* are, for the ſubſtance and *anfractus* of them, the ſame with thoſe of Quadrupeds, only differing in the figure, as being ſhorter: But what they want in length, they make up in breadth. They have alſo the like teguments called *dura* and *pia-mater*. Six or ſeven pair of nerves, beſides the Optick: the ſame ventricles; only in the *medulla oblongata* we obſerved not theſe protuberances called *nates* and *teſtes*. The Skull (*Cranium*) is not ſo ſtrong and thick, as in Quadrupeds, but articulated after the ſame manner to the firſt *Vertebra* of the back-bone. This largeneſs of the brain, and correſpondence of it to that of man, argue this Creature to be of more than ordinary wit, and capacity, and make to ſeem leſs fabulous and improbable thoſe Ancient ſtories, related by *Herodotus* concerning *Arion*: By *Pliny* the Elder *

concerning

* L. 9. hiſt. nat. c. 8.

concerning a Dolphin enamoured of a Boy, whom he was wont to carry croſs a bay of the Sea, from *Baiæ* to *Puteoli*, to School, &c. By *Pliny* the Younger, of another enamoured of a boy at *Hippo* in *Africa*, whom he was wont to carry upon his back in like manner. The ſtory is worth the noting: *Epiſt.*33.*l.*9.

But to proceed; this fiſh had in each Jaw 48 teeth, ſtanding in a row like to little blunt pegs. The Tongue was flat above, of an equal breadth to the very tip, which was toothed or pectinated about the edges, tyed firmly down to the bottom of the mouth all along the middle, as *Ariſtotle* truly ſaith: whence I cannot but wonder, that *Rondeletius* ſhould herein contradict *Ariſtotle*, and affirm (contrary to truth, as I believe) *quòd Dolphinis lingua eſt mobilis, quæ modò exeri modò condi poteſt:* Unleſs perchance in this particular the Dolphin differs from the Porpeſs. For the Porpeſs is, as I take it, the *Phocæna* of the Ancient, which is a leſſer ſort of Dolphin, and not the *Dolphinus*; at leaſt if the fiſh, we are deſcribing, were a Porpeſs; for the teeth of this fiſh were leſſer than, and of a different figure from, thoſe in the jaw of the Dolphin we got beyond Seas: yet is the difference not great between the *Dolphin* and *Phocæna*. As for that fiſh, which our Sea-men now adays call the Dolphin, and which, as it is deſcribed by Mr. *Terry* and *Ligon*, hath teeth on its tongue, ſmall ſcales, is finn'd like a rock, of a pleaſant ſmell and taſt: what it is I know not, but I am ſure it is *toto genere* different from the *Dolphin* of the Ancients.

We obſerved not in this fiſh any Noſtrils beſides thoſe in the *fiſtula*, nor any ear-holes or *meatus auditorii* at all; wherein alſo *Ariſtotle* agreeth with us; which yet *Rondeletius* found out near the eyes: it being manifeſt, ſaith he, that a Dolphin doth hear, and ſeeing no creature can hear without a paſſage for that purpoſe to convey ſounds to the brain: *Hac ratione impulſus, cùm Delphini cranium diligentiſſimè contemplatus eſſem, manifeſtiſſimum audiendi meatum, qui ad cerebrum uſque patet, inveni ſtatim poſt oculum, tam exiguum, ut ferè oculorum aciem fugiat.* And we obſerved in the Skull a bone anſwering to the *Os petroſum*, which moſt certainly was for the uſe of hearing. It had 6 ſhort Ribs that had no Cartilages, and ſeven that had Cartilages (on each ſide I mean.) The Breaſt-bone was very ſmall. As for the name *Porpeſs*, I agree with *Geſner*, that it was ſo called, *quaſi Porcus Piſcis*, moſt nations calling this fiſh *Porcus Marinus*, or the Sea-ſwine. Indeed it reſembles a Swine in many particulars, as the fat, the ſtrength of the ſnout, &c.

A Letter of Francis Willoughby *Eſquire, of* Auguſt 24. 1671. *Containing ſome conſiderable Obſervations about that kind of Waſps, call'd* Veſpæ Ichneumones; *eſpecially their ſeveral ways of Breeding, and among them, that odd way of laying their Eggs in the Bodies of Caterpillars, &c.*

AS I remember, M. *Liſter's* opinion is, that the *Muſcæ Ichneumones* lay their Eggs in the bodies of Caterpillars; which I look upon as very ingenious and true, and muſt ſubſcribe to it, though I cannot yet abſolutely demonſtrate it, as I hoped I ſhould have done before this. Theſe *Ichneumones* have all four wings, *Antennæ* like Bees; their body hanging to their breaſt by a ſlender ligament, as in Waſps; moſt, if not all, have ſtings, and are made of a maggot, that ſpins her ſelf a *Theca* before ſhe turns into a *Nympha*. There is great variety of them; *Some* breed, as Bees do, laying an Egg, which produceth a maggot, which they feed till it comes to its full growth: *Others*, as we gueſs, thruſt in their Eggs into plants, the bodies of living caterpillars, maggots, &c. For, it is very ſurprizing to obſerve, that a great Caterpillar, inſtead of being changed into a Butter-fly (according to the uſual courſe of nature;) ſhould produce ſometimes one, ſometimes two or three, and ſometimes a whole ſwarm of *Ichneumones*. I have obſerved this Anomalous production in a great many ſorts of Caterpillars, both hairy, and ſmooth; in ſeveral ſorts of maggots, and, which is moſt ſtrange, in one Water-inſect. When there come many of theſe Ichneumon maggots out of the body of the ſame Caterpillar, they weave all their *Theca's* together into one bunch, which is ſometimes round with web about it, juſt like a bag of ſpiders Eggs; but I dare venture to anſwer M. *Liſter's* 10*th Quære* pag. 2172. of the Phil. Tranſ. negatively, that none of them feed upon ſpiders Eggs, but it is the ſimilitude of thoſe *Theca's*, conglobated together, to the Eggs of Spiders, that hath occaſioned the conjecture.

One of the green Caterpillars, common in the Heaths in the North, went ſo far on to her natural change, that ſhe made her ſelf up into a great brown *Theca*, almoſt of the ſhape of a bottle, which was filled with a ſwarm of *Ichneumones*. And I have obſerved in one or two other ſorts, that from the very *Aurelia* it-ſelf hath come an *Ichneumon*; which is very odd, that the Caterpillar, ſtung and impraegnated by the *Ichneumons*, ſhould be yet ſo far unhurt, and unconcerned, as to make her ſelf a *Theca*, and to be turned into an *Aurelia*.

I have often ſeen a great *Ichneumon* dragging a Caterpillar in the high-way. This year Mr. *Wray*, in company with another ingenious neighbour, obſerved one haling a large green caterpillar much bigger than her ſelf, which after ſhe had drawn the length of a pearch, ſhe laid down, and then takes out a little pellet of Earth, with which ſhe had ſtopped the mouth of a ſmall hole like a worm-hole; then ſhe goes down into it, and ſtaying a very little comes up again, and draws the *eruca* down with her into the hole, and there leaves her; and afterwards not only ſtops but fills up the Hole, ſometimes carrying in little clods, and ſometimes ſcraping duſt with her feet, and throwing it backwards into the hole, going down after, her ſelf, to ram it cloſe. Once or twice ſhe flew up into a Pine-tree, which grew juſt over her hole, perhaps to fetch Cement; When the hole was full and even with the ſuperficies of the ground about it, ſhe draws two Pine-tree-leaves, and lays them near the mouth of the hole, and flyes away. Not taking notice that ſhe came any more in three or four days, we digged for the Caterpillar, and found it pretty deep. I put it into a box, expecting it would have produced an *Ichneumon*, but it dried away and nothing came of it. We lately obſerved a ſort of *Ichneumons*, or rather *veſpæ*, which prey upon ſeveral ſorts of flyes; when they fly with them, they hold them by the heads, and carry them under their bellies. Theſe make holes a great depth in the ground, in which they lay their young, and feed them with the flies they catch, creeping backwards into the ground, and drawing the flies after them. I ſuſpect they may at firſt lay their Eggs in the very body of a fly, but one fly being not enough to bring the young one to its full growth, they feed it with more: Their *Theca's* are at laſt all covered over with the wings, legs, and other fragments of flies.

A Letter of Mr. Martin Liſter, *written at York* Auguſt 25 1671. *confirming the Obſervation in N° 74. about Musk ſented Inſects; adding ſome Notes upon D.* Swammerdam's *book of Inſects, and on that of M.* Steno *concerning Petrify'd Shells.*

SIR,

I Have obſerved the two Inſects, which Mr. *Ray* ſaith, ſmell of Musk, which indeed they do in an high degree. The *ſmall Bees* are very frequent in the Wooles in *Lincoln-ſhire*, and about the latter end of *April* are to be found in paſtures and meadows, upon the early-blown flowers of a ſort of *Ranunculus*, as You have been rightly inform'd; but it is ſomething improper to ſay Bees feed on flowers: And likewiſe the ſame Bees are no leſs frequent on the flowers of *Dens Leonis*, &c. The *ſweet Beetle*, is a very large Inſect, and well known about *Cambridge*. All the trials I have made to preſerve them with their ſmell, have proved ineffectual: For, both ſorts of theſe Inſects will of themſelves in a very few weeks become almoſt quite ſent-leſs. To theſe I ſhall add another ſweet-ſmelling Inſect, which is a Hexapode-worm feeding on *Gallium luteum*.

The Obſervation of the *Veſpæ Ichneumones*, as it hath relation to Spiders, I willingly reſerve for other Papers: yet I may tell you in general, that this kind of Inſect is one of the greateſt puzzels in nature; there being few Excreſcencies of Plants, and very many births of Inſects, wherein theſe ſlender Waſps after divers ſtrange ways are concerned.

Though I be at preſent from my Books, yet I well remember the paſſage, which Mr. *Willoughby* refers you to in *Muffet* *. And he is well able to judge, whether the Obſervation be made upon the ſame ſort of Inſect. I conceive it a fault not conſiſtent with Ingenious Spirits, to paſs by in ſilence the Induſtry

* See *Numb.* 74. *p.* 2221.

of Moderns as well as of Ancient Writers; according to that of *C. Celſus*: *Oportet neque recentiores viros in his fraudare, quæ vel repererunt, vel rectè ſecuti ſunt; & tamen ea, quæ ab antiquioribus poſita ſunt, authoribus ſuis reddere.* You can beſt inform me, what D. *Swammerdam* does in a matter of this nature: when I read in the Account given us by you of his Book, *Numb.* 64; that Snails are both Male and Female; that Caterpillars may teach us, by their feeding, the correſpondence of the vertues of Plants, &c; I am deſirous to know, whether he quote Mr. *Ray* for the *former*, as having publiſh't the Obſervation ten years ago at leaſt; and for the *latter*, the Learned and Noble D. *Columna*, who did propoſe the way of eſſaying the vertues of Plants by the palats of Inſects in the beginning of this Age.

But I leave this, and proceed to a remark of my own; and it ſhall be, if you pleaſe, concerning *Petrified Shells*; I mean ſuch Shells, as I have obſerved in our Engliſh ſtone-Quarries. But Sir, let me premiſe thus much, that I am confident, that you at leaſt will acquit me, and not believe me one of a litigious nature. This I ſay in reference to what I have lately read in *Steno's Prodromus*, that, if my ſentiments on this particular are ſomewhat different from his, it proceeds not from a ſpirit of contradiction, but from a different view of Nature. Firſt then, we will eaſily believe, that in ſome Countries, and particularly along the ſhores of the Mediterranean Sea, there may all manner of Sea ſhells be found *promiſcuouſly* included in Rocks or Earth, and at good diſtances too from the Sea. But, for our Engliſh-inland *Quarries*, which alſo abound with infinite number and great varieties of ſhells, I am apt to think, there is no ſuch matter, as Petrifying of Shells in the buſineſs (or, as *Steno* explains himſelf p. 84. in the Engliſh Verſion, & *alibi*, that the ſubſtance of thoſe ſhells, formerly belonging to animals, hath been diſſolved or waſted by the penetrating force of juices, and that a ſtony ſubſtance is come in the place thereof,) but that theſe Cockle-like ſtones ever were, as they are at preſent, *Lapides ſui generis*, and never any part of an Animal. That they are ſo at preſent, is in effect confeſſed by *Steno* in the above cited page; and it is moſt certain, that our Engliſh Quarry-ſhells (to continue that abuſive name) have no parts of a different Texture from the rock or quarry they are taken, that is, that there is no ſuch thing as *ſhell* in theſe reſemblances of ſhells; but that Iron-ſtone Cockles are all Iron-ſtone; Lime or marble all Lime-ſtone and Marble; Sparre or Chryſtalline-ſhells all Sparre, &c. and that they never were any part of an Animal. My reaſon is: That Quarries of different ſtone yeild us quite different ſorts or ſpecies of ſhells, not only one from another (as thoſe Cockle-ſtones of the Iron-ſtone Quarries of *Adderton* in *York-ſhire* differ from thoſe found in the Lead-mines of the neighbouring mountains, and both theſe from that Cockle-Quarrie of *Wansford-bridge* in *Northampton-ſhire*, and all three from thoſe to be found in the Quarries about *Gunthrop* and *Beavour-Caſtle*, &c;) but, I dare boldly ſay, from any thing in nature beſides, that either the land, ſalt, or freſh water doth yeild us. 'Tis true, that I have picked out of that one Quarry of *Wansford* very reſemblances of *Murices*, *Telinæ*, *Turbines*, *Cochleæ*, &c. and yet I am not convinced, when I particularly examined ſome of our Engliſh ſhores for ſhells, alſo the freſh waters and the fields, that I did ever meet with (N. B.) any one of thoſe *ſpecies* of ſhells any where elſe, but in their reſpective Quarries, whence I conclude them *Lapides ſui generis*, and that they were not caſt in any *Animal-mold*, whoſe ſpecies or race is yet to be found in being at this day.

This argument perhaps will not ſo readily take place with thoſe perſons, that think it not worth the while exactly and minutely to diſtinguiſh the ſeveral *ſpecies* of the things of nature, but are content to acquieſce in *figure*, *reſemblance*, *kind*, and ſuch general notions; but when they ſhall pleaſe to condeſcend to heedful and accurate diſcriptions, they will, I doubt not, be of that opinion, which an attentive view of theſe things led me into ſome years ago. Though I make no doubt, but the Repoſitory of the *R. Society* is amply furniſhed with things of this nature; yet if you ſhall command them, I will ſend you up two or three ſorts of our Engliſh Cockle-ſtones of different Quarries, nearly reſembling one the other and all of them very like a common ſort of Sea-ſhell, and yet if there ſhall not be enough ſpecifically to diſtinguiſh them, and hinder them from being ſampled by any thing of the ſpoils of the Sea or freſh waters or the land-ſnails; my argument will fall, and I ſhall be happily convinced of an Errour.

Another Letter, written of the ſame Gentleman, from York Sept. 13. 1671. *enlarging his former Communications in Numb.* 75. *about* Vegetable Excreſcencies, *and* Ichneumon-Worms.

SIR,

IN my laſt Paper about *Vegetable Excreſcencies*, I was wholly ſilent of the opinion, which Mr. *Willoughby* is pleaſed to favour; and becauſe that worthy Gentleman hath ſo far made it probable, that now it ſeems only to depend upon the good fortune of ſome lucky Obſerver, I am willing to reaſſume my former thoughts, that all thoſe odd Obſervations, we have made of the *Births* of *Ichneumons*, do but beget in me a ſtrong belief, that they have a way yet unheeded, whereby they do as boldly, as ſubtly, convey their Eggs within the Bodies of Inſects and parts of Vegetables.

A fifth and laſt propoſition of that Paper * was, that the *ſubſtance of many Vegetable Excreſcencies ſeemed not to be the food of the worms to be found in them.* My meaning was, that the ſubſtance of the Vegetable Excreſcencies in which thoſe *Ichneumon* worms were to be found, was rather augmented, than diminiſhed or worm-eaten. And the like conformity of their feeding within Inſects is well obſerved by Mr. *Willoughby* *, that the imprægnated Caterpillars ſeem not to be concerned, though their bodies are full of Inſects of a quite different kind, but go on as far as they may towards the atchievement of the perfection of their own ſpecies. Thus I have ſeen a *Poppy-head* ſwoln to a monſtrous bulk, and yet all the Cells were not receptacles of *Ichneumons*, but ſome had good and ripe ſeed in them. I ſhall not refuſe Mr. *Willoughby* (though you know upon what grounds

* See *Numb.* 75. *p.* 2254.

* *See above in this very Tract.*

grounds, I have twice done it to you) the ſatisfaction of an Anſwer to my 10*th Quære*, by him reſolved negatively: It is true, the ſwarms of the *Ichneumons*, coming out of the ſides of Caterpillars, do immediatly make themſelves up into bunches, and each particular *Theca*, from the Cabbage-Caterpillar (for example,) is wrought about with yellow ſilk, as thoſe from the black and yellow-*Jacobæa*-Caterpillar with white, but as for web to cover thoſe bunches of *Theca's*, I never obſerved it but in the green Caterpillar ſo common in our *Lincoln-ſhire*-heaths, which are affixed to Bents or other plants. Theſe in truth never deceived but my expectation, for I verily thought I had found, when I firſt obſerved them, a Caterpillar equivalent to the *Indian* ſilk-worm; but having cut them in two, and expected to have found a Caterpillars *Chryſalis* in the middle, there preſented themſelves a ſwarm of *Ichneumons*. Theſe are as large many of them as my thumb, that is, at leaſt four times bigger then the *Folliculus* or Egg-bag of any Engliſh ſpider that I ever ſaw yet. By good fortune I have not thrown away the boxes, wherein I made the Obſervation concerning *Ichneumons* feeding upon the Eggs of certain Spiders. I have had them in ſeveral boxes, ſome 8, ſome 10, ſome 12 days in *Vermiculo*, feeding upon the very cakes of Spiders-eggs, before they wrought themſelves *Theca's* for further change; and they ſeldome exceeded the number of 5 to one cake of Eggs, &c. ſo that you may aſſure Mr. *Willoughby*, this is no conjecture, but a real obſervation accompanied with more circumſtances, than I am willing at preſent to relate.

An Accompt of ſome Books.

I. Johannis Walliſii, *S.Th.D. Geometriæ Profeſſoris in Academia* Oxonienſi, *Tractatûs de MOTU Pars III. A.* 1671. *in.* 4°.

IN this third and laſt part the Excellent Author (continuing his Doctrine of *Motion*, begun in the two foregoing parts,) treats, amongſt other things, of the Five *Mathematical Powers* (as they are called,) or noted Engines for the facilitation of Motion; which are *Vectis*, *Axis in Peritrochio*, *Trochlea*, *Cochlea*, & *Cuneus* (the Leaver, Winch, Pulley, Screw, and Wedge,) with others reducible to them. And particularly, of the *Leaver* (in its moſt uſual acceptation,) with one ſupport (and therein of the *Pinchers* and *Sheers*, &c.) and of a *Beam*, *Cole-ſtaff*, &c. ſuſtained by two or more ſupporters, with the ſeveral preſſures on each of them, according to their different poſitions; where alſo are deſcribed ſix ſeveral forms of *Flat Roofs*, for large Rooms, framed of ſhort Timbers (much ſhorter than the breadth of the Room,) mutually ſupporting one another: with methods of computing the weight ſuſtained by every joint. Of ſeveral ſorts of *Winchers*, *Winders*, *Capſtans*, *Rollers*, *Wheels of Engines* (with or without teeth,) *Boarers*, *Cranes*, &c. with the Reaſon and Meaſure of their force; As likewiſe the *Wheels of Coaches*, *Carts*, *or Waggons*, with the Reaſon of divers circumſtances in the Fabrick and uſe of them. Of *Pulleys*; of the meaſure and reaſon of their ſtrength. Of *Screws*; with the reaſon of their great force, and the meaſure of it; as alſo, the meaſure of the *Length of the Spiral line about a Cylinder* (whence the Screw takes its riſe,) and of the *Solid content of the Screw*. Of the *Compoſition*, *Acceleration*, and *Retardation* of Motions; and the motion of *Projectils* (things thrown, ſhot, &c.) with the nature of the lines deſcribed by ſuch motions. Of *Percuſſion* or *ſtriking*; with the meaſure and effects of *Blows*, or *Stroaks*, according as the bodies ſtriking do differently occur one to the other, and the *Center of force* in ſuch Percuſſion.

Of the *Wedge*, with the reaſon and meaſure of its force. Of *Repercuſſion, Reſilition*, or *Reflexion* of Bodies, which he derives from the *Spring* or *Elaſtick Virtue* in them: Of *Hydroſtaticks*, with the Reaſon and meaſure of ſinking or ſwimming of Heavy bodies in a Fluid: Of the *weight* and *Spring* of the *Air*, and the *Counterpoiſe* of the *Atmoſphere*; from whence he derives thoſe effects, which were wont to be aſcribed to the *Fuga vacui*, or Natures abhorring a vacuity; with the Explication and Reaſon of the ſeveral Phænomena of the *Torricellian* Experiment, and others of like nature, and of the very great contraction and expanſion of the Air: Of raiſing a great weight with a mans *breath*, blowing a *bladder*. And the Solution of divers other *Mechanical* queſtions.

II. Danielis Ludovici, *Medici Ducal. Saxo-Gothani, de PHARMACIA Moderno Seculo applicanda, Diſſertationes III.* Gothæ 1671. *in* 12o.

THe Learned and Experienced Author of this Book, having, it ſeems, really found, that neceſſity ſuggeſts the conſiderableſt and the moſt neceſſary, as well as the eaſieſt and cheapeſt Remedies for Man's health; and having thereupon very ſucceſsfully follow'd in his practiſe a method and rules ſutable thereunto, to the frequent relief and cure of his Patients, and to his own honor; reſolved to publiſh to the world the ſubſtance of his thoughts concerning the Adminiſtration of Phyſick, together with the Sum of his Experience and Practiſe therein; notwithſtanding what the Learned and Induſtrious *Zwelfer* or others had already ſaid upon this Subject; he being perſuaded, that Diſeaſes may as well, if not better, be cured by a few, plain and eaſily parable Medicins, than otherwiſe; provided they be by an honeſt and diſcreet Phyſitian uſed with Judgment, according to the nature, temper and condition of the Patient.

In reference hereunto, he declares himſelf in Three Diſſertations; In the *Firſt*, he ſhews, How the *Materia Medica* may throughout Nature's three kingdoms (as they ſpeak) be contracted, from that vaſt and luxuriant heap, met with in Diſpenſatories and other Phyſick-books, to a few ſimple and yet choice and efficacious Medicins; adding thereunto, *both* his Method of preparing ſuch remedies for all ſorts of diſeaſes,*and* withall ſhewing, how to bring them into a ſmall room,to contain the ſame thus contracted.

In this part the Reader will find the Author's thoughts, firſt touching ſuch Remedies as are pretended to be *Univerſal*; and ſecondly, an Enumeration of ſome of the choiceſt *Particular* Medicaments, of all ſorts; as Purgatives, Vomitives, Sudorificks, Aſtringent, Refrigeratives, Diureticks, Reſolving, Diſcuſſing, Corroborating, Deterſive, Anodyne,Narcoticks, Stomachicks, Hepaticks, Spleneticks, Uterine, Topicks, &c. Concerning all which he ſticks not to ſay,that he hath nothing raſhly nor groundleſly aſſerted of the Medicins by him retained or diſcarded.

In the *Second* he briefly treats of the neceſſity of Moderating the Rates of Medicins; which yet he doth in ſuch a manner, that on the one hand, Druggiſts, Apothecaries, &c. may not want encouragement to provide all neceſſary matter of Phyſick; and on the other hand, that the Common people may not be alienated from employing honeſt and skilful Phyſitians, nor from the uſe of proper medicins: where he particularly examins the *Chymical* preparations, (to which he is no Enemy,) and delivers his opinion as to what cheat there is frequently practiſed in priſing them, and how men may be directed to know very near the true rate of many of that kind.

In the *Third* he enumerates the benefits that may redound to Man-kind, by the way of Diſpenſing Medicins by Phyſitians themſelves, ſworn and skilful; as he obſerveth it to have been in the beginning, and even ſo late as in the next foregoing Age, and to be ſtill practiſed in all the *Aſiatic* Countries; Which he ſaith he adviſeth, not to countenance any dangerous way of preparing Medicins, but to ſecure the making of phyſick to well-known diſcreet and experienced Practitioners: conceiving, that thereby the poorer ſort of people, finding the Fee and Price of Phyſick to be in one hand, would be much leſs ſhy, than now they are, to repair to good

Phyſitians, and more deterr'd from conſulting *meer* Empiricks and Mountebanks, making great havock amongſt them; beſides that Phyſick would by that means be much improved; Intruders debarr'd from doing miſchief by the indiſcreet uſe of Receipts; and many ſudden Accidents, which admit not of the delay of ſtaying for both Phyſitian and Apothecary (as Apoplexies, Epilepſies, Hyſteric fits, &c.) better provided for.

Here and there the Author taketh occaſion to animadvert on thoſe pretended high *Arcana's*, *Catholicon's*, *Panacea's*, *Elixir's*, *Univerſal Menſtruum's*, particularly the *Alcaheſt*; yet without denying, that there may be *one* and the ſame Medicin ſo excellent as exceedingly to ſtrengthen and cleanſe the body, and to give relief in *many* diſeaſes.

Where he diſcourſeth of fitting Medicins to the Conſtitution of people, he obſerveth, that a certain ſort of laxative Aloe-pills are properer for Countries and people that drink Bier, than thoſe that drink Wine. And ſo he noteth, that Venæ-ſection is more uſeful to ſome Nations, than others.

If the Author had taken care to have delivered his matter in a clear ſtile, he would certainly have proved much more inſtructive, than, 'tis feared, he now will. This *Deſideratum*, we hope, will be ſatisfied in the ſecond Edition.

III. Joh. Bapt. Sylvatici *INSTITUTIO MEDICA de iis qui* Morbum ſimulant *deprehendendis*. Francofurti ad Mænum. *A.* 1671. *in* 12°.

THis *Italian* Author, having repreſented both the Importance of this argument, and aſſigned the Cauſes inducing people either to counterfait or to hide Diſeaſes (which he reduces to Fear, Shamefaſtneſs, and Profit;) enumerates the ſeveral Ways, how this Simulation or Diſſimulation may be performed. And of theſe he obſerveth chiefly three: The *firſt*, when a Sickneſs is pretended by Words only, and really is not; as a Colick, Head-ache, &c. to avoid appearance in publick or for other reaſons. The *ſecond*, when there appear ſigns and marks of diſeaſes in the Body, but are cauſed on purpoſe by Counterfaits for various ends; ſuch as ſeem to indicate a Fever, Scabbines, Leproſy, an Exulceration of the Lungs by ſpitting bloud, and Gravidation it ſelf, either to raiſe Compaſſion, as in Beggars, (as in the laſt caſe,) for Succeſſion, as in great Women, making it up by Suppoſititious Births. The *third*, when there is really a ſickneſs, but hid and concealed to the utmoſt; as the *Venereal Diſeaſe*, to avoid publick ſhame, or the loſs of an advantagious match, and eſpecially *Love ſickneſs*, cover'd out of modeſty, or for other cauſes, but often inducing a high degree of Melancholy, and ſometimes Madneſs.

This being diſpatched, he giveth ſeveral Directions, *firſt* in *general*; How counterfaited ſickneſſes may be found out, and the various arts and cheats detected: For the due performance of which, he judgeth it not ſufficient to have great Medical Experience, but beſides finds it requiſite to employ more than ordinary ſagacity in exploring all circumſtances and outward accidents, and eſpecially thoſe things, that relate particularly to the genius, temper and ſtate of the ſuppoſed Counterfeit.

Secondly in *particular*; where he teacheth, how thoſe are to be diſcover'd, that counterfeit Pain, and pretend Impotency, Sterility, Virginity (*circa ultimum hoc argumentum multa diſſerens curioſa, tum de variis eam mentiendi modis, tum de deprehendendæ mentitæ difficultatibus, tum de* Hymenis *exiſtentia*;) Further thoſe that fain or conciliate Madneſs, or Inſenſibleneſs, for times and occaſions; as alſo ſuch, that raiſe, by art, Tumors, Scabs, Ulcers, Fevers, and Bloud-ſpitting. Moreover, how to detect diſguiſed Love-ſickneſs, together with divers Examples of its Diſcovery, and the method and ſlight employed both in making that diſcovery, and in curing the malady; for the latter of which he commends chiefly the import of that of the Poet, *Intrat amor mentes uſu, dediſcitur uſu;*

And the advice of *Lucretius*;

Sed fugitare decet ſimulacra & pabula amoris,
Abſterrere ſibi atque aliò convertere mentem
Ac jacere Amorem collectum in Corpora quoque.

To which he adds the way of diſcovering ſuppoſed Dæmoniacks, and Enthuſiaſts; yet acknowledging withall the difficulty of diſcerning ſuch Impoſtures; of which he eſteemeth many may be aſcribed partly to Melancholie, partly to Uterin-fits, partly to plain Cheating, as is that of the *Ventriloqui*.

He ſubjoins the method of finding out women that hide their Conception, and thoſe that counterfeit it: And concludeth all with the skill requiſite to diſcover ſuch as are infected with the *Lues Venerea*, and ſtudy to palliate it with ſome other Diſeaſe; and thoſe alſo to whom Poiſon hath been given ſecretly.

IV. *QUADRIPARTITUM BOTANICUM* Simonis Pauli *Medici Regii in* Dania *Argentorati in* 4°.

HAving been lately queſtioned by ſome conſiderable men (one of whom is a Learned Phyſitian of *London*,) why no notice had been taken in theſe *Tracts* of this Uſeful piece, we thought good, (alledging, for the excuſe of our tardineſs herein, this Book's eſcaping our view hitherto,) to give the enſuing accompt of it.

The Learned Author then undertaketh in it to deſcribe chiefly the Uſes and Virtues of thoſe Simples or Plants which growing in *Europe*, are by long Experience approved of; treating more particularly of thoſe, that grow in *Denmark* and *Norway*, which are the Countries, he is in a more eſpecial manner related to.

This Deſcription he performeth in ſuch a Method, that he reduceth the ſaid Plants to Four *Claſſes* Alphabetically, according to the Four *Seaſons* of the year, wherein they grow or are in flower; that ſo the Curious *Botaniſt* and others may know, when ſuch and ſuch Plants are to be had and gather'd for uſe. This he doth, beginning from the Winter-plants, and thence proceeding to the Vernal and Æſtival, and concluding with the Autumnal.

He inſerts in many places divers Remedies and uſeful Advices for Health: In the doing of which, and ſhewing himſelf very particularly concern'd for the cure of the *Tabes Anglica*, (the *Conſumption,*) ſo much reigning in *England*, he employeth more than one *page* in recommending to the *Engliſh* Nation (for whom he expreſſeth a ſingular eſteem) that Plant, which the Latins call *Chelidonium majus vulgare*, the *greater Celandine*, as an approved medicin and no leſs than a Specifick to cure that Diſeaſe, after the uſe of Antimonial Emeticks; teaching withall, that it is to be prepar'd and uſed, for that purpoſe, in its Tincture, together with the *Trifolium fibrinum Tabernæmontani*; and exhorting alſo diligent Anatomiſts, to open and well to examine the Liver and other *viſcera* of ſuch, as dye of this ſickneſs, being himſelf altogether perſuaded, that thoſe are the Parts, which are primarily and by *idiopathy* affected in a Conſumption, and the Lungs not otherwiſe than ſecondarily and by *conſent*; Where he alſo taketh notice, that one of the main cauſes of the frequency of this Diſeaſe among the Engliſh is, their eating abundance of ſugar and other ſweet things, which, in his opinion, do cauſe a great Obſtruction in the Liver and other Entrals, (the origin of *Conſumptions*:) which by the aforeſaid Plants is powerfully reſolved and opened. See him p. 45. to 49.

Further, amongſt many other Advices, this Author obſerveth, that there is hardly any thing more inſalubrious, than to eat freſhly gather'd Fruit, eſpecially if they were expoſed to the Sun; eſteeming, that the impreſſion, made by the Sun and the fruit, not being yet diſſipated, cauſeth ſuch a fermentation in the bloud, as is inſeparable from a Fever.

For the cure of a *Tertian* he adviſeth the Patient to take four or five drops of *Roſe-mary Oyl* in ***Carduus benedictus*** and *Fumiterry* water, and to ſweat upon it, the body having been before prepar'd by general Medicins, &c.

He omits not, upon occaſion to interſperſe very curious remarks; as that the Herb, called *Gramen Oſſifragum*, hath this property, that, if any Animal do eat of it, the nerves and tendons will be ſo relaxed, that it ſhall hardly be able to ſtir, but be as if its loins were broken: for which he thinks this reaſon may be given, that poſſibly in thoſe places, where this Plant grows, there are Mines of Quickſilver or Lead, whence it may derive this quality ſo hoſtile to the nerves. There is another particular, among many others, which we cannot leave un-mentioned, *viz.* That, whereas common Chymiſts make *Sulphur* to be the principal Cauſe of the *Colour* in Mixts, he rather aſcribeth it to *Salt*, (as he alſo doth *Taſt* and *Smell*;) For the proof of which he alledgeth divers reaſons, which he confirms by this Experience; That, to make Black Horſes become of a Dapple-gray, you need only give them for ſome days in the Spring a handful or two of ſmall Oak-buttons mingled with their Oats: And this change of Colour he attributes to the Vitriol abounding in Oak, and which cauſeth that cracking noiſe, which is made by that wood when put in the fire.

To all which I muſt add what he noteth concerning the Inteſtin called *Cæcum*, the Uſe of which is ſo much controverted amongſt Anatomiſts, but diſcover'd by this Author to be, that as the *Bladder of Gall* is the receptacle of the *Gall*, ſo this ***Cæcum*** is the receiver of the *Flatus* or winds; and that thence it is, that commonly 'tis found empty or only ſome clear water in it, which the winds have been turn'd into: Adding, that Nature hath made this Inteſtin larger in Hoggs, Birds of prey, and other Beaſts, which by reaſon of their voracity are more ſubject to crudities, and therefore to winds,&c.

He annexes to the whole ſeveral Appendixes; whereof *one* contains the *Doſes* of the received Emeticks and Purgatives both ſimple and compound; *Another* exſpatiateth into the praiſes of *Hippocrates*: The *third* conſiders the ſeveral Duties of Phyſitians, Apothecaries and Chirurgions: The *fourth* and laſt delivers a Method of making a good Herball.

ERRATA left un-obſerved in ſome of the later Tracts.

IN Numb.73.p.2197.l.2. *del.* that whole line: *that hole in ſome of the Shop-Kermes being accidental only, and ever on the bottom-part cleaving to the branch; and the time of gathering them for colour is without doubt before they are pierced, and whileſt the Animal is yet in* vermiculo, *and conſequently the Husk intire.*

In Numb.74. p.2238. l.38. *r.*h.6.37′. *ib.*l.39. *in col.*2. *r.*h.5.52′.

In Numb.75. p.2244. l.3. *r. Real Infinites.* p.2245. l.8. *r. any proportion.* p.2247. l.ult. *r. of* $14\frac{6}{14}$. p.2248. l.36. *r. not* $14\frac{4}{14}$. p.2269. l.36. *r. halitum meum.* p.2270. l.27. *r. altit. eſt peripheriâ.*

LONDON,

Ptinted for *John Martyn*, Printer to the *Royal Society.* 1671.

Numb. 77.

PHILOSOPHICAL TRANSACTIONS.

Novemb. 20, 1671.

The CONTENTS.

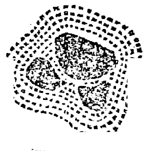
Obſervations, made by Mr. Hook, *both of the* Solar Spots *lately diſcover'd, and the* Eclipſe *of the* Moon *of Sept.* 8. 1671. *Some Additions of M.*Liſter *to his former Communications about* Vegetable Excreſcencies, *and* Ichneumon Waſps, *together with an Inquiry concerning* Tarantula's. *Predictions of the Viſible* Appulſes *of the* Moon *to, and her near* Tranſits *by certain* Fixt *Stars for A.*1672. *An Accompt of ſome Books*: I. *SHEEPS BOVW en BESTIER, that is, NAVAL ARCHITECTURE and CONDUCT, in Low-Dutch, by* N. Witſen. II. *RECHERCHES & OBSERVATIONS ſur les VIPERES, par Monſ.* Bourdelot. III. *Admirandorum FOSSILIUM, quæ in tractu* Hildesheimenſi *reperiuntur, Deſcriptio, à D.*Frid. Lachmund. IV. *De CATHARRHIS, A. R.*Lower *M.D.* V. *DELICIÆ PHYSICÆ* Goth. Voigtii.

Obſervations made by Mr. Hook, *of ſome* Spots *in the* Sun, *return'd after they had paſſed over the Upper Hemi-ſphere of the Sun which is hid from Us; according as was predicted**.

* *See* Numb. 75. p. 2253.

A*Uguſt* 30. 1671. I ſaw a large Spot in the Center of the Suns face about noon, but had not then time to make any more exact obſervation thereof.

Septemb. 1. at 3 a clock I ſaw the ſame Spot moved about a quarter of the Diameter of the Sun Weſtward, and it appeared of this form exactly, that is, it conſiſted of one greater and two leſſer black Spots with a dusky cloud incompaſſing them: The Diameter of the whole Phænomenon was about $\frac{1}{72}$ of the Diameter of the Sun, and it was diſtant from the next adjoining limb, $\frac{18}{72}$ (that is, exactly one quarter) of the Diameter of the Sun. This I examined and meaſured ſeveral times, and found very exact.



So far He. To which we hope we ſhall be able to add, by another opportunity, what hath been further obſerved abroad, as well of the *ſecond* progreſs of theſe Spots on the Sun's apparent diſque, as of the continuation of their *former* motion thereon.

Obſervations made by the ſame, of the late Eclipſe *of the* Moon, *the 8th of* September 1671. ſt. vet.

SEptemb. 8, 1671. H. 7. 27′½. I firſt obſerved the Moon Eclipſed when it began to be enlightened, the total darkneſs being already paſt. The ſhadow paſſed through the middle of the Spot called by *Hevelius* M. *Porphyrius*, half of the ſaid ſpot appearing without the ſhadow and the other-half being darkned thereby.

H 7.49′. The ſhadow paſſed through the middle of M. *Sinai*, through the middle of the Eaſtermoſt of the three Lakes called *Mare Adriaticum*, and juſt touched the ridge of the *Appennine* Mountains.

H.7.54′. It paſſed the middle of the J. *Besbicus* in the *Propontis*.

H.8.0′½. It paſſed through the ſtreights of the *Pontus Euxinus* at the Promontories *Acheruſia* and *Ariſtes*.

H.8. 6′½. It touched the *Palus Mæotis*, which *Palus Mæotis* was then diſtant from the limb of the Moon next adjacent one third part of its ſhorter diameter or breadth.

H.8.17′. The ſhadow went off the body of the Moon upon the innermoſt limb-line of *Hevelius* his large chart of the Moon at the 29 diviſion juſt without the J. *Major* of the *Caſpian Sea*. The duskiſh *Penumbra* left not the limb of the Moon quite without ſome kind of darkneſs, till 8. 29′; at which time I found that ſide of the Moon, which the ſhadow laſt left, was full as light and clear as the other.

About four or five minutes after, the ſhadow was gone off, I perceived a faint repreſentation of Colours upon that part of the body of the Moon, which was moſt affected with the *Penumbra* ſomewhat reſembling the colours of a faint *Halo* about the Moon; this grew fainter and fainter, and after a few minutes was no more viſible. It did not ſeem to be cauſed by any clouds or exhalations in the Air, the sky near the Moon being very clear, and the ſaid colours not appearing any where, but upon the dusky part of its *Phaſis*, Poſſibly it might be cauſed by the Refraction of the light from the Sun through the Atmoſphere about the Earth.

LUNÆ ad FIXAS Appulſus Viſibiles, nec non arctiores juxta eas Tranſitus, obſervabiles *A.*1672: Prædicti, & ad Meridianum Latitudinemque *Londini*, è Tabulis *Carolinis* accuratè ſupputati à *Joh. Flamſtedio* Derbienſi-Anglo.

FIXARUM Nomina, Loci, Latitudines & Magnitudines, quibus vel corporales Appulſus vel propinquiores Tranſitus habet L U N A *Anno* 1672, *de mente & placitis Authoris* Carolini, *ſunt;*

	Fixarum Nomina.	Loci. s.	°.	′	″	Latit. °.	′	Magn.
1	*In Lino Auſtrali ♓ Lucidior. 3^{um} præcedens*	♈	9	34	48	2	11 *Bor*	4
	Media & lucida Pleiadum	♉	25	19	48	4	0	3
3	2^{a} *Bor. inter pedes ♊ & Erichtonium*	♊	23	54	48	4	6	4
4	*Borea præcedentium in* □ *Cancri*	♌	0	44	48	3	31	
5	*Aſellus boreus*	♌	2	52	48	3	8	
6	*Cor Leonis, Regulus*	♌	25	12	48	0	26½	
	In ſiniſtra axilla Leonis	♍	1	43	48	0	8	
8	*Media in pede Leonis*	♍	16	52	48	0	33 *Au.*	
	Media ſequens ſub brach. ſiniſtro ♍ infer.	♎	11	34	18	3	23	
10	*Auſtralis trium in fronte ♏ lucidior*	♏	28	19	48	5	22	
11	*Quæ Cor ♏ ſequitur ad Auſtrum*	♐	6	48	48		50	
12	*Septentrionalis trium in ventre ♑*	♒	8	13	48		1	5
13	*Duarum lucidarum in Cauda præcedens*	♒	17	9	48	2	26	
14	*Sequens*	♒	18	55	48	2	23	
15	*Quæ ad Clunes Aquarii*	♒	24	8	48		0	6
16	*In effuſione aquæ ♒ii ſuccedens Auſtralis*	♓	7	0	48	0	19	4

Anno 1672.

Januar. 4. *poſt mediam noctem ſequentem* Luna *teget ſtellam ſuperioris Tabellæ* 5^{am}, Aſellum boreum, *cujus ſub illa*

p.m.	*h.*	′	″			′	″	
Immerſio	13.	33.	43.	*Latit.* ✱^{a} *à Luna in*	*Immerſ.*	6.	0.	*Bor.*
Emerſio	14.	32.	30.		*Emerſ.*	10.	41.	
Mora	0.	58.	17.					

Januar. 27. *Sub Occaſum Solis* Pleiades *aſſequitur*; *cujus phænomeni phaſes tali ſuccedunt ordine*;

h. ′ ″		*^{a} à Centro ☽^{a} Lat. ′ ″
3. 46. 48.	*Occidentalis lucidior ſubripitur*—	6. 34. *Bor.*
5. 2. 12.	*Eadem eluctatur*————	2. 35. *B:*
5. 4. 54.	*Media & lucida ſubtegitur*——	6. 22. *Auſt.*
5. 48. 30.	*Inſima occidentali proxima abſcond.*	9. 15. *A.*
6. 0. 20.	*Sequens borealior abſconditur*——	15. 9. *B.*
6. 13. 0.	*Orientalis ſuperior occupatur*——	14. 22. *A.*
6. 15. 20.	*Media & lucida remittitur*——	10. 15. *A.*

Occidentalem, borealiorem, & orientalium lucidiorem Luna, juxta numeros Carolinos, *illibatas præteribit. Inſimæ, ſequentis Borealioris, & Orientalis ſuperioris obtectiones (factâ modo de Schemate, è recentibus propriis Obſervationibus delineato, probabili aliquâ conjecturâ) diſpoſui; quarum Emerſiones, haud multo (ſperem) incommodo omiſſas, cœlum ſudum ſi fuerit, fidi Cœliſpices obſervare ne graventur, dum ipſe hujus Aſteriſmi ſtellas iterum dimetior, quò accuratiora de Phænomenis futuris, Lunæ per eas tranſeuntis, pronunciare poſſim.*

Februar. 10. *Poſt med. noctem ſequentem, vel potius* Febr. 11. *mane, abſcondet* Luna *Stellam* 11^{am} Tabellæ; *cujus erit horis diei* 11^a *matutinis*,

	h. ′ ″			′ ″	
Sub-ingreſſus	3. 52. 39.	*^{a} *Latit. à Centro Lunæ in*	*Sub ingr.*	7. 21.	*B.*
Emerſio	4. 45. 39.		*Emerſ.*	10. 12.	
Mora ſub ☽	0. 53. 0.				

Maii 2. *Poſt med. noct. ſequentem, vel* Maii 3. *mane*, Luna *eandem ſtellam rurſus teget, quæ horis matutinis diei* 3^a *habet*

	h. ′ ″			′ ″	
Obtectionem	2. 59. 29.	*^{a} *Lat. à Centro* ☽^{a} *in*	*Ingr.*	2. 6.	*B.*
Retectionem	4. 1. 46.		*Exitu*	1. 3.	
Durat. ſub ☽^{a}	1. 2. 17.				

Junii 18. *Sole ipſo in meridie culminante, Luna* Regulum *ſeu* Cor ♌^{is}, *ſtellam* Tabulæ 6^{tam}, *Auſtrino limbo occupabit: Quod quidem phænomenon ob plenam diei lucem inobſervabile prorſus credideram, ac ſanè ut tale omiſiſſem, ni monuiſſet* Clar. Oldenburgius, *comperiſſe* Dn Hook, *etiam* Diurnos *Lunæ ad Fixas majores appulſus, methodo ipſi exploratâ eſſe obſervabiles;*

vabiles, taliumque Apparentiarum, ſi quando acciderent, præmonitiones identidem efflagitâſſet. Nactus igitur hoc Phænomenon (quo vel utilius, ut infra patebit è Synopſi, vel celebrius à Luna nequit unquam obvenire,) Ingenioſiſſimo Micrographo *hanc ejuſdem præmonſtrationem, gratitudinis ergò, dicatam habere, idque ipſi præ cæteris, qui obſervandi callent methodum, obſervandum committere velim.*

Reguli ſeu Baſiliſci dant Tabulæ, p.m.

	h. ′ ″			′ ″	
Occultationem	0. 11. 0.	*Lat.* ✱^{a} *à Centro* ☽^{a} *in*	*Occult.*	15. 48.	*Auſt.*
Retectionem	0. 20. 0.		*Retect.*	12. 12.	
Moram ſub ☽	0. 9. 0.				

Cordis *ad Centrum* ☽^{a} *proxima appropinquatio eſt* 15′. 39″; Lunæ *ſemidiameter apparens modò* 15′. 49″, *ita ut* 10 *ſcrup. ſecundos duntaxat à limbo Lunæ, mediâ Eclipſi, diſſita futura ſit Stella: Unde, ſi aliqua obveniat Cœli à Numeris diſcrepantia, facillimè idipſum Obſervatori innoteſcet.*

Julii 2. *Luna in* ♒ 24 *gr. Stellam teget* 15^{am} Tabulæ *noſtræ; cujus videatur ſub Luna*

	h. ′ ″			′ ″
Incurſus	12. 49. 19.	*Lat.* ✱^{a} *à Centro* ☽^{a} *in*	*Incurſu*	0. 57. *B.*
Exitus	13. 59. 26.		*Exitu*	4. 52. *A.*
Mora	1. 17. 7.			

Julii 23. *Luna rurſus appellit ad Stellam* 11^{am}, *quam abſcindet h.* 10. 12′. 26″. *p.m; lat.* ✱^{a} *tum à centro* ☽^{a} 10′. 3″. *B; prius tamen ſub horizonte mergetur quàm liberet ſtellam; cujus propterea Emerſio* Americanis *conſpicienda, nobis exſpectanda non eſt.*

Julii 28. *Poſt med. noct. ſequentem, ſed* Jul. 29. *mane, Luna in* ♒ 8 *gr. abſcondet Stellam* Tabulæ 12^{am}, *cujus erit horis matutinis, diei ſc.* 29, *cum* Luna

	h. ′ ″			′ ″	
Congreſſus,	1. 29. 6. *mane*	*Lat.* ✱^{a} *à Centro Luna in*	*Sub-ingr.*	8. 40.	*B.*
Sejunctio à ☽,	2. 32. 4.		*Emerſ.*	2. 25.	
Mora ſub ☽,	1. 2. 58.				

Julii 29. *Nondum elapſis horis* 20. *à priori Occultatione, Luna in* ♒ 18 *gr. ſubripiet Stellam* Tabulæ 14^{am}; *cujus erit*

	h. ′ ″			′ ″	
Sub-ingreſſus	8. 32. 26.	*Lat.* ✱^{a} *à Centro* ☽^{a} *in*	*Ingr.*	0. 25.	*Auſt.*
Emerſio	9. 39. 0.		*Emerſ.*	3. 54.	
Mora ſub ☽	1. 6. 43.				

Auguſti 12. *Veſperi* Solem *in* ♍ gr. 0. 11′. 44″. Luna *teget: Eclipſis erit*

		h. ′ ″	
p.m.	*Initium*	5. 30. 16.	
	Max. Obſcur.	6. 6. 47.	*Digiti, ſummâ Eclipſi*
	Appar. Syzygion	6. 11. 39.	dig. ′
	Finis	6. 43. 20.	*deficientes* 3. 8 1/5.
	Duratio	1. 13. 4.	

Octob. 23. *Veſperi Luna in ♈ 9, jungitur Stellæ* 1ª; *cujus erit*

	h. ′ ″			′ ″	
Occultatio	8. 19. 23.	*Lat.* ✱ᵃ *à Centro Luna in*	*Ingr.*	2. 0.	*Auſt.*
Retectio	9. 32. 43.		*Retect.*	8. 39.	
Mora ſub ☽	1. 13. 20.				

Octob. 23. *Veſperi Luna in* ♊ 24. *gr. occultabit Stellam* Tabulæ 3ᵃᵐ, *cujus ſub Lunam*

	h. ′ ″			′ ″	
Subingreſſus	9. 21. 8.	*Lat.* ✱ᵃ *à Centro Lunæ in*	*Subing.*	5. 52.	*B.*
Egreſſus	10. 25. 0.		*Egreſſ.*	5. 15.	
Mora ſub ☽	1. 3. 52.				

Novemb. 17. *Luna veſperi in* ♓ 7. *gr. centeget Stellam* Tabulæ 16ᵃᵐ, *quam*

	h. ′ ″			′ ″	
Abſcondet	6. 25. 42.	*Lat.* ✱ᵃ *à Centro Lunæ in*	*Occult.*	6. 15.	*Auſt.*
Remittet	7. 23. 25.		*Retect.*	12. 42.	
Retinet	0. 57. 43.				

Decemb. 22. *Luna in* ♊ 24. *gr. cum Stella* Tabulæ 3ª; *cujus cum Luna*

	h. ′ ″			′ ″	
Congreſſus	7. 28. 33.	*Lat.* ✱ᵃ *à Centro Lunæ in*	*Congr.*	0. 5.	*Auſt.*
Sejunctio à ☽	8. 31. 0.		*Sejunct.*	2. 20.	
Mora ſub ea	1. 2. 27.				

Preterea Februar. 23. *paulò ante mediam noctem*;
Auguſti 5. *poſt ſequentem mediam noctem*;
Octobr. 26. *ipſâ mediâ nocte*;

Et Decemb. 20. *poſt mediam noctem*; *Luna aliquas è* Pleiadibus *cooperiet*; *de quibus tamen Occultationibus certi aliquid conſtituere in præſentiarum minimè audeo*; *Eo negotio in aliud tempus* (*quando ſcil. de earum diſtantiis & locis, quorum jam obſervandorum ſatago, res certa mihi innotuerit*; *quod brevi fore ſpes eſt,*) *dilato.* *Interea* Lunæ *juxta* Fixas *aliquas Tranſitus arctiores hic adjungam, quas vigiliis noſtris haud minus dignas, ac Occultationes, arbitror.*

	H. ′ ″	′ ″			′ ″ raliorz.
Januar.	4—10. 19. 39.	☽ 17. 47. *in conſ.* ✱ᵃ	4ᵃ	*cum Lat.* 23. 58.	*Auſt.*
	7—18. 34. 23.	21. 3. *in ant.* ✱ᵃ	7ᵃ	*cum Lat.* 17. 57.	*Auſt.*
Februar.	25—12. 13. 22.	14. 20. *in ant.* ✱ᵃ	3ᵃ	*cum Lat.* 25. 59.	*Bor.*
Martii	2—13. 5. 30.	4. 11. *in ant.* ✱ᵃ	8ᵃ	*cum Lat.* 22. 35.	*Auſt.*
Martii	4—10 51. 11.	11. 48. *in conſ.* ✱	9ᵃ	*cum Lat.* 23. 4.	*Bor.*
	26—13. 33. 11.	14 26. *in conſ.* ✱	5ᵃ	*cum Lat.* 28. 20.	*Auſt.*
Auguſti	25—14. 47. 23.	23. 52. *in ant.* ✱	13ᵃ	*cum Lat.* 11. 33.	*Auſt.*
Septemb.	8—16. 6. 7.	8. 12. *in conſ.* ✱	7ᵃ	*cum Lat.* 26. 0.	*Auſt.*
Octob.	19— 7. 37. 37.	30. 30. *in ant.* ✱	13ᵃ	*cum Lat.* 14. 20.	*Bor.*
Novemb.	1—17. 44. 7.	13. 45. *in conſ.* ✱	6ᵃ	*cum Lat.* 20. 9.	*Auſt.*

*Prolixiorum adeò ſupputationum proventu ita ſtrictim exhibito, reſtat, ut ordine quo ſibi ſuccedunt phænomena recenſeam: Quod dum præſtitum eo, Lunæ ſimul motus, è Tabulis ad data tempora exquiſitos, unà eademque Synopſi adjungam, eo ſcil. ſine ut ultrò eam inſpicientibus Aſtrophilis, cùm qua*litates *tum* uſus *& commoda cujuſque Apparentiæ, quatenus ſcil. vel quomodo Lunæ inſerviat Motibus limandis, innoteſcant.*

Temp. apparans Londini.					*Anomal. ☽æ media.*				*☽ a ☉ pri. æquata.*				*Arg. Latit.*				*Parall. horiz.*		*Horiz. ſemi-d.*		*Horoſc. Oriens.*		*Altit. cent. ☽.*		*Ang. Paral.*	
	d.	*h.*	′	″	*s.*	*o.*	′	″	*s.*	*o.*	′	″	*s.*	*o.*	′	″	′	″	′	″		*gr.*	*o.*	′	*o.*	′
Jan.	4	10	19	39	7	27	42	57	6	5	40	46	4	12	57	54			15	48	♎	1	52	49	62	14
		13	39	38	7	29	31	51	6	7	27	4	4	15	4	53	58	23	15	47	♏	6¼	59	0	84	24
Jan.	7	18	34	23	9	11	24	7	7	17	1	50	6	0	32	50	53	42	14	31	♑	5	24	51	80	59
	27	4	35	20	5	25	4	50	3	7	46	54	2	7	30	47	63	54	17	16	♌	17⅓	57	14	79	3
Feb.	10	15	53	34	0	4	6	53	9	3	53	56	8	19	57	42	50	57	13	45	♐	29½	7	24	61	12
	25	12	13	22	6	18	2	54	3	6	32	5	3	8	38	30	63	40	17	12	♏	28	22	36	45	19
Mart.	2	13	5	30	9	6	53	30	5	23	28	24	6	1	23	19	56	18	15	13	♐	11	40	0	84	17
	4	10	51	11	10	1	47	48	6	15	57	56	6	27	24	19	55	45	15	4	♏	18	26	53	45	59
	26	13	33	11	7	20	37	58	3	15	4	57	4	17	32	26	60	54	16	28	♑	5½	16	22	63	43
Mai.	2	15	15	12	11	24	31	40	6	14	6	35	8	25	57	45	52	42	14	15	♈	22	6	9	78	54
Jun.	17	23	57	19	8	0	50	0	1	14	48	28	5	16	53	31	57	55	15	38	♎	5	35	40	34	45
Jul.	2	13	5	58	2	10	57	21	7	3	52	50	11	17	15	20	55	58	15	8	♊	12	22	11	82	9
	23	10	5	37	11	13	43	50	3	24	51	50	8	28	5	54	50	57	13	46	♉	4	3	56	76	2
	28	14	15	3	1	21	19	15	5	22	44	33	11	1	15	4	53	47	14	33	♋	21	9	55	50	27
	29	8	45	0	8	1	23	50	6	1	40	11	11	11	34	18	54	45	14	47	♈	1½	8	31	78	57
Aug.	12	5	18	14	8	2	25	44	11	29	46	29	5	23	33	18	58	28	58	48	♑	19½	15	53	72	7
	25	14	47	23	1	27	25	5	5	4	35	9	11	10	27	3	55	18	14	57	♌	15	0	45	52	29
Sept.	8	16	6	7	8	1	0	31	11	4	39	24	5	27	49	2	59	45	16	9	♍	8				
Oct.	19	7	37	37	1	21	57	17	3	11	29	51	11	13	55	54	52	29	14	11	♋	11	19	18	57	58
	23	8	33	16	3	14	42	50	4	29	42	35	1	5	26	14	56	27	15	16	♋	17	41	52	53	38
	28	10	3	50	5	20	51	19	7	5	22	59	3	22	49	29	62	8	16	48	♌	7	35	4	53	48
Nov.	1	17	44	7	7	17	17	20	9	2	26	2	5	22	53	37	61	16	16	33	♏	1	50	47	56	59
	17	6	13	30	2	10	4	6	3	2	48	4	0	5	38	2	55	17	14	56	♋	9½	29	58	69	42
Dec.	22	8	36	38	5	18	42	13	5	12	48	49	3	23	30	25	61	0	16	29	♍	3½	57	3	57	1

Taceo de Phaſi Lunæ *in Umbris Terræ patientis, quippe de qua plus ſatis Aſtrologi. Interim hæc fideliter ſupputata & indigitata Phænomena cùm Illuſtriſſimæ* Regiæ Societati, *tum, Ipſius Auſpiciis, omnibus alibi Cælorum Studioſis impenſè commendo: quibus ampliſſimum Scientiæ incrementum, perennes ſtudiorum profectus, Cælumque imprimis his obſervationibus peragendis omninò propitium animitus exopto.*

Some Additions of Mr. Lyſter *to his former Communications about* Vegetable Excreſcencies, *and* Ichneumon Waſps; *together with an Inquiry concerning* Tarantula's, *and a Diſcovery of another* Musk-ſented Inſect: *tranſmitted to the Publiſher from* York *in two Letters, of Octob.* 16. *and* 28. 1671.

The Extract of one of theſe Letters:

THat this Letter may not be without all matter of Philoſophy, you may take an occaſion to put this *Quære* to your correſpondents of *Italy*, viz.

Whether the *Tarantula* be not a *Phalangium* (that is, a ſix-eyed skipping Spider) as *Matthiolus* and others ſeem to tell us? if ſo, whether ſome later Authors impoſe not on us by giving us a Cutt or Figure of a Net or *Reticulum orbiculatum*, which our Engliſh *Phalangia* are never (that I know of) obſerved to weave or make uſe of in hunting? and whether the perſon bit by a *Tarantula*, be not ever, when on his feet, diſpoſed to and actually dancing after the nature of a *Phalangium*, which never moves but by skippings; even as it happens with ſuch that are bitten by a Mad Dog, who have been ſometimes obſerved to bark like a dog, &c. And if ſo, what we are to think and credit concerning ſuch and ſuch Muſical tunes, ſaid to be moſt agreeable and tending to the Cure of perſons bit by a Tarantula?

But next among other things, I had the good fortune to preſent Mr. *Willoughby* giving me the honour of two viſits, with a *Musk-Ant* * an Inſect obſerved by me not many days before his firſt viſit: And though I cannot ſend you the Inſects themſelves, as having parted with all I had, yet I will the Note, *viz.*

* *See of two or three more* Musk-Inſects Num. 74. *p.* 2220. *and* Numb. 76. *p.* 2281.

Septemb. 2. I found in a Sandy Ditch-bank, the firſt hollow beyond the Ring-houſes in the high-road to *London* about a mile and an half from *York*, a ſort of exceeding ſmall *Piſmires* (by which note alone I think they may be ſufficiently diſtinguiſh't from all at leaſt that I have ſeen.)

Thoſe *without* wings were of a light-yellow or flaxen, and being broken at on's noſtrils they emitted, like others, an acid or ſowre ſent; but thoſe of the ſame bank *with* wings, were cole-black, and theſe, bruiſed and ſmelt to, emitted ſo fragrant a ſmell like *musk*, that I muſt confeſs they were too ſtrong for me to endure: yet having kept them ſome time by me, the more delicate ſex were not diſpleaſed with the ſmell. And an Apothecary in this City, famous for his diligence in Chymical Operations, did compare them (unſeen and not yet made known to him) to an excellent balſom, he is wont to prepare.

Mr. *Willoughby* inform'd me, that he had found the *Goat-chafer* or *Sweet beetle* * out of ſeaſon as to that ſmell; and thereupon asked me, what I had obſerved as to the time of their ſweeteſt and ſtrongeſt ſmelling? I anſwer'd, that I believed it to be at the time of the *Coit*, for aſmuch as at that time, when I took them highly perfumed, I had obſerved the female full of Egg.

* *Of which ſee* Numb. 74. p. 2220. *and* N. 76. p. 2281.

The Extract of the other Letter:

I Send you a ſecond paper about *Vegetable Excreſcencies*; the ſhortneſs of the former * and ſome things therein, perhaps liable to Exception, obliging me thereto.

* *Of which ſee* Numb. 75. p. 2254.

Concerning the fifth and laſt propoſition of the *firſt* paper, it might be more intelligibly expreſſed thus, *viz.* That the ſubſtance or *fibrous* part of *many* Vegetable Excreſcencies *ſeems* not to be the food of the worms found in them: My meaning is, that the worms in thoſe Vegetable Excreſcencies, which produce *Ichneumons* (to which kind of Inſect we would limit this propoſition, and therefore expunge all other inſtances,) theſe worms, I ſay, do not ſeem to devour the ſubſtance or fibrous part of them, as other worms eat the Kernels of nuts, &c. but that (what-ever their manner of feeding is, and we doubt not but that they are nouriſh't in and upon ſome part of them,) the Vegetable Excreſcencies ſtill mightily increaſe in bulk, and riſe as the worms feed.

It is obſervable (to endeavour a Solution) that ſome of the *Ichneumons* delight to feed of a liquid matter, as the Eggs of Spiders, the juices (if not Eggs) within the bodies of Caterpillars and Maggots: Whence we conjecture, that thoſe of the ſame *Genus*, to be found in Vegetable Excreſcencies, may in like manner ſuck-in the juices of the equivalent parts of Vegetables. And *this* the dry and ſpongy texture of ſome of theſe kind of Excreſcencies ſeems to evince: For, if you cut in pieces a *Wild-poppy-head*, for example, (or the great and ſoft balls of the *Oak*) you'l find in thoſe partitions, wherein theſe worms are lodged, nothing but a pithy ſubſtance like that of young Elder; and if there chance to be any cells yet unſeiſed, (which I have ſometimes obſerved) the ſeeds therein will be found yet entire and ripe. Whence very probably they feed upon or ſuck-in by little and little the yet liquid pulp of the tender ſeeds, and leave the ſubſtance or fibrous part to be expanded into an Excreſcence.

As for matter of Fact, to clear the truth of that opinion, that the divers races of *Ichneumons* are generated by their reſpective Animal-parents, and particularly that thoſe, which the divers Excreſcencies of Vegetables produce, are not *plantigenous*, I am in great hopes, the inſtance of *Poppy-heads*, ſwoln into Excreſcencies, will favour us the next ſeaſon. My expectation is chiefly grounded upon the condition and nature of that plant; which is ſuch, that nothing can pierce the skin of it and wound it but it muſt neceſſarily leave a mark of its entry, the milky juice ſpringing upon the lighteſt puncture, and drying and *concreting* ſuddainly into a red ſcar: And this, I think, I may affirm, that of the many heads grown into Excreſcencies, which I gathered this Summer, all had more or leſs of thoſe marks upon them. But our aim is here only to make way for the Obſervation againſt the next ſeaſon; to which purpoſe alſo we propoſe the following *Quære's*;

1. Whether the ſhagged balls of the *Wild Roſe* are not Excreſcencies grown from the bud and very fruit of the plant; like as the *Wild-Poppy*-heads are apparently not for worms but ſeed.

2. Whether the large and ſoft balls of the Oak are not in like manner the bud and acorn with all the parts of a ſprouting branch, thus monſtrouſly perverted from the firſt deſign of nature?

3. Upon what parts or juices the *Ichneumon*-worms, ſuppoſed to be thruſt into Caterpillars and other Maggots, can be thought to feed: And whether there be not actually Eggs in Caterpillars and Maggots (as there are to be obſerved in their reſpective *Chryſalis's*) ſufficient to ſerve them for food?

Concerning the name ἰχνεύμων, although I could willingly refer you to Mr. *Ray*, who is another *Heſychius*; yet for preſent ſatisfaction I ſhall tranſcribe what the Excellent Critique G. *Voſſius* ſaith (c. 16. *de Inimicitia*;) *Ichneumon* (i.e. *Mus Pharaonis ſive Ægyptiacus*) *Crocodili & Aſpidis ova indagat, unde illi* Ichneumonis *nomen, quaſi dicas* Indagatorem (ἀπὸ τοῦ ἰχνεύειν:) *Reperta utriuſque ova conterit; ut eſt apud Oppianum in 3° de Venatione: Nicander tamen ait, eum Aſpidis ova humi mandare.*

Now a like Obſervation of certain Inſects of the Waſp-kind, made no doubt by ſome of the Antients, occaſioned the application of that name to *Waſps* as well as to that *Ægyptian Mouſe*. Yet cannot I remember to have met with in any of the Antients of more than one text concerning thoſe Waſps; viz. *Ariſtot. de Hiſt. Anim. l. 5. c. 20.* which *Pliny* (vid. lib. 11. c. 21.) hath rendred, in a manner *verbatim*, thus: *Veſpæ, quæ* Ichneumones *vocantur (ſunt autem minores quàm aliæ) unum genus ex araneis perimunt, phalangium appellatum, & in nidos ſuos ferunt; deinde illinunt, & ex iis, incubando, ſuum genus procreant.*

How far this relation is true, and agreeable to modern Obſervations, we ſhall have perhaps occaſion to diſcourſe of elſe-where; Our deſign here is only to tell you, that we have enough to make us believe, that thoſe very Inſects, we have been treating of, are, for kind, the *Ichneumons* of the Antients.

An Accompt of ſome Books.

I. *SCHEEPS-BOVW en BESTIER, that is, NAVAL ARCHITECTVRE and CONDVCT; by* N. Witſen, *printed at* Amſterdam, 1671. *in Fol.*

THe Ingenious and Induſtrious Author of this Work having conſidered with himſelf, that his Country-men, though ſo flouriſhing in Navigation and Naval Architecture, had yet publiſhed nothing of that ſubject, except what *De Heer Sjaſſens* had written of the *Politie* of Shipping, did reſolve with himſelf to break that ſilence, and to communicate unto the World a Hiſtory both of the *Ancient* and *Modern* way of *Building, Equipping*, and *Governing* of Ships; which deſign having been by him put in execution in this Book, he therein largely treateth not only of the Manner of the Naval Architecture uſed by the *Greeks* and *Romans*, together with their Naval Exerciſes, Battles, Diſcipline, Laws and Cuſtoms; but alſo of the Method and Way uſed at this day both in his *own* Country, *England, France*, and the *Indies*, together with the difference there is between the Manner of Building Ships, practiſed by *Others*, from that of the *Dutch*, and particularly of the *Indian* way of Equipping their Ships, and the manner of Building Galleys: All inriched with an ample Seamans Dictionary, and a great number of Illuſtrating Diagrams.

The whole Work is divided into Two main Parts; The *Firſt* contains XIX Chapters; whereof,

1. Giveth an account of the firſt Builders of Ships, and in general of the Building of the Antients, both before and after the Deluge; where the Author particularly diſcourſeth of *Noah's Ark*; of divers Ships found deep under ground; of the ſtructure of the Ship *Argo*; of the Navigation of the *Phenicians, Rhodians, Corinthians, Ægyptians, Tyrians, Cretians*, &c.

2. Delivers the Way of the Naval Architecture of the *Greeks* and *Romans*, both for War and Commerce, together with the manner of Equipping their Ships row'd with Oars, both of ſingle and manifold ranks, and the fitting of the Rowers:

Where he treats of the *Biremis Piſtrix*; the *Biremis Vallata Oneraria Cerealis Siracuſia*; the *Biremis* and *Tiremis turrita*; the *Triremis vallata*, &c.

3. Diſcourſeth of ſeveral ſorts of the Ancients Structure of Ships, and chiefly of the great Veſſels built by *Philopater* and *Hiero*, the pompous make of both which is here repreſented; as alſo of the numerouſneſs and launching of their Ships.

4. Enumerateth divers un-common Obſervables in Ships both of Ancient and Later times, as in *Noah's Ark*, the Ships of *Argo*, *Theoris*, *Paralon*, *Salamine*, *Magellan*, *Drake*, &c. To which he adds that Noble Fregat built in *England* A. 1637. called the *Soverain*, of 1637 Tuns, having a keel that was to be drawn by 28 oxen and 4 horſes; as alſo a Deſcription of the *Spaniſh Armada* of 1588, called the *Invincible*; not forgeting the *Bucentoro* of the *Venetians*; nor the *Mageleza* of the *Suedes*, a Man of war, appearing at Sea about 100 years ſince, and having ſides of that thickneſs, that all bullets ſtuck within her boards. In this Chapter is inſerted a Relation of a Ship found in the time of *Pius* II. in the *Numidian* Sea, 12 fathoms under water, 30 foot long and of a proportionable breadth, built of *Cyprus* and *Larix* wood, and reduced to that hardneſs, that it would hardly burn; as it was alſo very hard to cut: No ſigns in it of any rottenneſs any where; its deck cover'd with paper, linnen and leaden plates, faſtned with guilt nails, as alſo were the boards; the whole ſhip ſo cloſe, that not a drop of water was found ſoaked through into any cloſe room. The Author concludeth it to have lain there about 1400 years.

5. Relateth, what great Fleets were anciently ſet out, and what far voyages undertaken: where he taketh particular notice of the Expedition of the *Argonautes*, of *Xerxes*, of *Alexander M*, of *Rome*, and *Cartage*, of the *Saxons*, *Britons*, &c.

6. Deſcribeth what the Antients obſerved in Building their Ships, and how they cloſed, rigged and beautified them; where occur ſeveral relations of divers ways of cementing, caulking, pitching, and defending ſhips from rottenneſs and worms; of which I ſhall only mention, what occaſionally he alledgeth of a certain cement now uſed by the Indians, made of finely beaten reeds, chalk, and oyl, with which

their Ships are over-laid to keep them from rotting.

7. Rehearſeth the State of Naval Architecture after the Ruine of the Roman Empire; eſpecially amongſt the *Scybians*, and *Saracens*, invading *Italy*, *Spain*, *France*, &c; together with the endeavors of the *Romans* under *Juſtinian* and others, to defend themſelves againſt thoſe *Barbarians*: Not omitting, what was done by the *Danes*, *Huns*, *Engliſh*, *Saxons*, and particularly by that Brave and Vigilant King *Edgar*, who maintained a Fleet of 3600 ſail, which he divided into three Squadrons, called the Eaſtern, Weſtern and Northern, ſailing in them himſelf every year round about *England* and *Scotland*. To this he annexeth, at what time Shipping was at the loweſt ebb, and how it began to be reſtored by ſome Kings of *Portugal*, the *Frieſlanders*, and his Countrymen in general, about 200 years ſince.

8. Giveth an ample and very particular account of the preſent way of Building Ships, both for War and Trade, in *Holland*. Where are repreſented not only the Parts of a Ship in their ſeveral Figures, together with their Names, and Uſes; but alſo a whole Ship, perfectly rigg'd, and on it the parts marked, with reference to the annexed Diſcourſe, wherein they are deſcribed.

9. Contains a particular Deſcription of the Proportions of all the Parts of a Dutch ſhip, and the Meaſures of ſome peculiar ſorts of Veſſels of that Country: Where he inſtanceth in ſeveral Ships of different lengths, as of 134, 160, 150, 140, 125, 130, feet long; as alſo in a Frigot, 130 feet long; and aſſigneth the meaſures and proportions of the reſpective parts thereof: Adding withall an account of divers Frigots and other Ships, there built by ſome of their moſt famous Shipwrights, to the number of *Twenty ſix*.

10. Declareth the Make and Weight of all ſorts of Ankers, and the bigneſs and weight of Cables in general, and in particular of certain Ships built there; as alſo the meaſures and proportions of Maſts, and Sails, of divers Veſſels, and how Sails may be beſt ordered to take in moſt wind, mathematically ſhown: Where Occaſion is taken to inſert conſiderable remarks about the ſeveral ſorts of Hemp, and the beſt way of

working Cables, and the care to be had in the manner of tarring them, and in the degree of heating the tar for that purpoſe, &c.

11. Delivers the Method of conjoyning the parts of a Ship one after another, uſed by *Dutch* Ship wrights; together with a repreſentation of a Ship upon the *Stocks*, and their manner of *Launching* ſhips: Adding their way of redreſſing a ſhip that lieth on her ſide, as well as of laying her on her ſide for repairing or cleanſing; and intimating alſo, that amongſt them a ſhip 180 or 185 feet long, can conveniently be built up, by 50 men, in 5 months; and that the charges of building a ſhip, 165 feet long, 43 feet broad, and 31 feet high, built of the beſt timber, amounts to 74152 gilders; beſides its iron-work, which together with its rigging comes to 19483 gilders more, without the warlick equipage: Judging withall, that ſuch a ſhip, well built and kept with care, may laſt 20, 30, 40, to 50 years; mentioning alſo, that he had ſeen a certain *Engliſh* veſſel, of 70 years old, and not yet altogether uſeleſs.

12. Speaks of the meaſures and proportions of ſeveral other Sea-veſſels, that are of a ſtructure and uſe different from that of the former: ſuch as are Flutes, Green-land-veſſels for Whale-fiſhing, Advice-yachts, Boyars, Galliots, Fire-ſhips, Pinks, Buſſes, &c.

13. Treats of other ſorts of Veſſels, as Coaſters, Yachts, Challoups, Lighters, Boats, Skiffs, Double-bottom'd Veſſels, ſhips riſing without being unladen, and ſuch as move under water, or againſt the ſtream, and eſpecially of a Veſſel uſed at *Amſterdam*, whereby in one day may be fetch't up 50 or 60 boats of mud, performed by the means of a big wheel and large ſpoons. In the ſame *Chapter*, inſtructions are given concerning the Choice of Ship-Timber; where are to be found many neceſſary and very uſeful Obſervations and Directions relating to the purpoſe in hand, and a particular commendation of the *Engliſh* and *Iriſh* Oak for ſhips. To all which is added an Enumeration of all ſorts of Tools and Engins requiſite for this kind of building.

14. Conſiders the Structure of *Galleys* and *Galleaſſes* in particular, and what is peculiar in them and different from other ſhips; taking alſo notice in brief of *Galeaſſes*, *Brigantines*, *Feluccas*, &c.

15. Diſcourſeth of the Proportions obſerved by the *Engliſh* and *French* in the building of their reſpective ſhips: Where he taketh ſpecial notice of Four Frigats of four diſtinct rates; exhibiting and deſcribing them as they are to be found in the Duke of Northumberland, *Robert Dudley*, his *Arcano del Mare*, printed at Florence; and concluding this *Chapter* with a deſcription of the Frigat called the *Royal Charles*, (ſome years ſince fallen into *Dutch* hands,) and an Encomium of the *Engliſh* Orders at Sea.

16. Maketh a Narrative of the *Indian* way of framing ſhips: Where firſt of all occur the *Canoe's* and their Structure out of one only Tree, hollow'd by burning. *Next*, the *Chineſe Yonks* of *Nankin* (a ſort of flat-bottom'd Boats,) and other Veſſels of the ſame Country; among which thoſe are deſcribed, that are as big as little Iſlands, and hold many houſes and families, floating upon the waters, and going up and down through all the parts of *China* that have the conveniency of navigable rivers: To which is added a deſcription of a Royal *Chineſe* boat, of a Serpentin ſhape, ſent to receive the Dutch Ambaſſadors in thoſe parts. *Then* the ſhips of *Malabar*, *Ternate*, *Sumatra*, *Japan*, *Terra del Fuego*, (in which laſt are made very artificial boats of the Barks of the thickeſt Trees, as in *Malabar* ſome are made of large Canes, called *Bambu*;) Moreover of *Borneo* and *Calecut*. After this, the Author returns to *China*, and relateth, that ſhips are found there, which upon rollers ſail over Land; and giveth a large account of the vaſt number of ſhips, both warlike and markantile, maintained in that Empire; together with the odd Architecture of the ſame, and the skil of that people in Navigation; as alſo an intimation taken out of *Martinius*, touching the Ancientneſs of the Chineſe Shipping, and their Colonies found ſetled in *Madagaſcar*, and their Sailing in old times even as far as to the *Red Sea*. He concludeth this *Chapter* with deſcribing the ſhips of *Madagaſcar*, *Bengala*, *Macaſſar*, *Siam*, *Pegu*, *Maldives*, *Ormus*, *Congo*, *Ruſſia*, *Lapland*, *Virginia*, &c.

17. **Demonſtrates**, how much weight of water there lieth againſt a Ship moving at Sea; having firſt laid down certain propoſitions made out by *Stevinus* in his *Hydroſtaticks*; which Writers foot-ſteps our Author acknowledgeth to have follow'd herein. Beſides he examins alſo the Center of Gravity of a Ship; which being known, it may be certainly concluded, How a Ship is to lye upon the water, and how heavy it is when 'tis floating, whether loaden or unloaden. Laſtly he imparts the way of the Excellent *Hudde*, of calculating exactly, what burthen a ſhip can carry either in Salt or Sweet water? Where he alſo examins the weight of the water, in which a Ship is floating; for which purpoſe he cauſed to be made a *Cube* of Copper-plates, of half an Amſterdam-foot a ſide, fitted after a certain manner, too particular to be here related, whereby he found, that upon the 15*th* of *March*, a foot of *Rain water* weighed 49 *lb.* 14½ ounces; and *Y-water*, 46 *lb.* 2⅛ ounces; and *Texel-water*, 46 *lb.* 9 ounces. To all which he adds the way of meaſuring the Quantity of a Ship's burthen, that hath been agreed upon between the King of Denmark and the States of the United Provinces; as alſo ſeveral ways of doing the ſame, uſed by other Nations, and particularly that of the *Engliſh* and *French*.

18. Explains and gives reaſons for the ſeveral ſizes and ſhapes of the parts of a ſhip; as why the Maſts ought juſt to be of ſuch a bulk and height? Why ſome of them muſt incline backward, ſome ſtand upright? Why a ſmall Rudder can turn a great Ship; and a little Anker ſtay it? What maketh Ships not feel the Rudder? Why Veſſels too broad are weak and prove inconvenient in high Winds? Why long and moderately narrow Ships endure the Sea better, than ſhort and broad ones? How the Keel ought to be placed? Why *Gallions* and the parts of them are fram'd as they are? Why a Ship is to be broader before, then abaft? That Fregats, built long, narrow and low, ſail beſt. What hinders well-ſailing? Why Turkiſh Veſſels are excellent Sailers? And many qneſtions more, conſidered by this Author.

19. Reckons up the particulars of the looſe *apparatus* neceſſary in a moderately far Voyage for an hundred men, in a ſhip 134 foot long, both for her conduct and defence, and the Food of the Marriners.

And ſo much of the *Firſt* Part of this Book.

The *Second* part comprehends the EQUIPPING and Conduct of Ships, and Navies, as well by the Antients as Moderns; couched in IV. Chapters.

1. Diſcourſeth of the Equipping and Ordering of Ships and Sea-men, practiſed by the *Greeks* and *Romans*; as alſo of the Old rights and Laws of Marriners, their Victuals, Encouragements, Puniſhments, and Arms, together with their manner of Fighting, and Triumphing upon a victory obtained: where are related ſeveral Sea-battels and their Events; as alſo divers famous Pirats, recorded in the Roman Hiſtory.

2. Deſcribeth the preſent Conduct and Government of the States General of the United Provinces in their Warlike Fleets; together with their Orders for Convoy-ſhips. Where are inſerted the particular Commands and Inſtructions given by the ſaid States in the late War between England and that Republick; as alſo their Placaet concerning *Prizes*. To all which is ſubjoined the Ship-maſters and Stiermans way of diſciplining the Sea-men, and the manner and form of commanding them to perform their part according to the ſeveral occaſions at Sea. Which Chapter is concluded with ſeveral remarks concerning the *Load-ſtone* and the *Sea-Compaſs*, and eſpecially with what care the Needle for the Compaſs is to be touch't by the Magnet.

3. Obſerveth the Ordering of Merchant-ſhips, and the Conduct of Admiralties; as alſo how they man and arm their Trade-ſhips in general, and in particular thoſe that navigate Nord ward, and their Herring-Buſſes; as alſo thoſe that ſaile to the Mediterranean. Further, how things are managed amongſt them on Ship-board, in reference to the Seamen, Officers, Souldiers, &c. in their Navigation to the Eaſt and Weſt-Indies, Greenland, &c. In this *Chapter* 'tis alſo repreſented, what benefits redound to a Country by Shipping, as to the increaſe both of its Power and Wealth.

4. Contains a Sea-Dictionary, explaining the Names of the parts of a ſhip, and the words and phraſes uſed among Seamen for all ſorts of naval concerns.

II RECHERCHES & OBSERVATIONS ſur les VIPERES; faites par Monſieur Bourdelot. A Paris, 1671. in 12°.

THis ſmall Diſcourſe is an Anſwer to a Letter, which the Excellently Learned Author had received from Signor *Redi*, Firſt Phyſitian to the Great Duke of *Florence**. In it Monſ. *Bourdelot* declares, that though Signor *Redi's* Letter do not finally decide the matter in queſtion, yet it is very uſeful to the farther knowledge of the nature of Vipers by the particularities by him recited. The controverſie being, whether the *Jellow* liquor about the long and crooked teeth of vipers are, even when they are not irritated, venomous; (which is affirmed by Signor *Redi*,) or, Whether it be a ſimple innoxious *ſaliva* or ſpittle, as is maintained by Monſieur *Charas*: This Author obſerveth, that that liquor controverted is not *yellow* in *French* vipers, as 'tis in thoſe of *Italy*: Which remark he makes uſe of to the advantage of the often mentioned *Redi*, who would reconcile theſe two opinions by ſuggeſting, that the Vipers of *Italy* and *France* are differently diſpoſed; countenancing this Obſervation with what he hath taken notice of, that the venom of the *Lues Venerea* is much more maligne in hotter than colder Countries; and alſo with what is conſtantly related by Voyagers, *viz*, that Animals are more venomous in *Africa* than elſewhere. But that notwithſtanding this, the Objection made by M. *Charas* ſeems not cogent, when he ſpeaks of a Vipers teeth, whoſe bite prov'd not mortal, although that teeth had been rubbed off and perfectly dried with bread-crums; whereby he would ſupport that Experiment, in which he cauſed to be bitten and killed 7 or 8 animals one after another, of which the laſt bitten died firſt; it ſeeming impoſſible to him, that there ſhould be remaining any of that ſalival Juice about his teeth after ſo many bitings; and that therefore, to give a cauſe of that death, recourſe muſt be had to the fierceneſs of the ſpirits, tranſmitted to that crooked teeth, to be revenged of thoſe, againſt whom theſe beaſts are provoked; which angry ſpirits being thruſt into the fleſh and veins do infect the ſpirits and blood of thoſe that are bitten. To which our Author anſwers, that 'tis hard to maintain,that the vindicative Spirits can paſs through a body ſo ſolid,as Teeth are,eſpecially ſince the *little* teeth have been found by Experience to cauſe as dangerous effects, as the *great* ones, after that theſe had been broken out: And that therefore it may be juſtly doubted,whether by the ſaid bread-crums all the ſalival liquor about the teeth of an animal alive could be taken away; as it may be truly affirmed, that the Vipers-teeth are inceſſantly plunged into their ſheaths, and do there continually fill themſelves with the ſaid Juice.

---

*Of this Letter, being printed, an Accompt was given in Numb. 66. p. 2036. of theſe Tracts.

But he eſteems withall,that in hot Countries this liquor may work alone, when conveyed into our fleſh by the teeth of a dead Viper, or even with an Ear-picker, into a wound; as it comes to paſs in *Italy* and in hot Countries; but in *France* and in colder parts,eſpecially ſuch vipers being uſed as are kept in tuns and brought from a far off,the ſaid juice not being ſtrong enough alone, needs to be made keen by the bilious breath of the angred Viper.

And here the Author exſpatiateth into a diſcourſe, to ſhew, that without recurring to a vindicative ſpirit, paſſing through a ſharp teeth as through a needle, the cholerick breath of an incenſed viper may exceedingly invigorate that liquor,and prove a ferment to the ſame, like ſome *Afflatus malignus & Halitus teter*. Where,among other particulars, he ſpeaketh of a Gardiner, who upon the grafting of his Trees, never found more than half the grafts to thrive; of which at laſt this cauſe was diſcovered,that he ſtill took together two grafts to inoculate,of which he firſt grafted that which he held in his hand,and then the other which he held in his mouth,which having rotten teeth, did taint the ſweetneſs of the vegetative Juice in the ſecond graft,which was always found wither'd away. To which he adds,how certain breaths of wind corrupt meat, eſpecially when it thunders and lightens; how the exſpirations of ſome men and animals, when corrupted,do the like; and that one may be particularly ſenſible of the breath of a man in choller, and that the bite of a redhaired perſon is venomous;moreover, that if a man having waſhed his mouth with vinegar breaths into a bottle,the wine put into it will ſowre,and that a butchers boy having eaten oignons and garlick, or having rotten teeth, the beef or mutton by him blow'd upon the night before, will be livid next morning,and worth nothing, &c. He mentions likewiſe an Experiment,by him intended to be made, of putting ſome of the foming of a mad dog into the wound of a ſound dog, to ſee whether that will make him mad alſo, and whether it be not the breath of the biting dog,which by its agitated ſpirits cauſeth that commotion of madneſs. Whereupon he obſerves further, that the breath coming from the ſpongy Lungs of vipers enraged, is of greater force then all thoſe he hath ſpoken of,and that 'tis full of bilious ſpirits when they are angred. Where he examins,whether *Vipers* have a paſſage aſcending from the Bladder of Gall to the throat, as he affirms he hath found in *Snakes*,and particularly in thoſe of the *Grotta dei Serpi* near *Bracciano*,famous for curing ſtubborn maladies by big ſnakes winding themſelves about the bodies of the ſick expoſed there; of which he affirms to have ſeen the Experiment himſelf.

He concludeth the whole with obſerving, 1. That as Vipers are eaſily provoked, ſo they are very gentle when their bile is not agitated; and that it may be ſaid, they know thoſe that tend them, who take them out of their tuns with whole handfulls innoxiouſly. 2. That Vipers do exceedingly abound in Spirits, whence they are ſo proper to reſtore the aged,and to prolong their days; and that the heart or liver of a viper is one of the greateſt Alexitery's in the world, and admirably efficacious in malign fevers.

We muſt not omit to take notice here,that this Author p. 17. 18 mentions, that the Gentlemen of the *Academy of England* (for ſo he is pleaſed to call them) do aſcribe the venom of *Waſps* and *Bees* to the *Laceration* that is made by the ſtings of thoſe creatures.

Whom he means by this *Academy*, we know not, unleſs it be the *R. Society*,who yet never publiſh't any thing as theirs, whether of this or any other kind. If he mean the *Micrography*,compoſed by M. *Hook*, a Member of that Body,the contents of that book, however licenſed by that *Society* as ingenious,or of any other, thus honoured, ought by no means to be taken for the ſenſe of that Body. But neither does that Book affirm any ſuch thing,but plainly obſerves,that the ſaid laceration of the ſtinging animal is follow'd by a virulent liquor which is there made the cauſe of the troubleſom effects, that enſue. So that the ſenſe of this part of the *Micrography*, (if that be pointed at) hath been ill interpreted and repreſented to our Author; who (not to leave that unmentioned) promiſeth to publiſh ſomething, wherein he means to ſhew, that there are many Inſects, which moſt aſſuredly are not bred by an Egg: Which piece the Curious are very deſirous to ſee.

III. *Admirandorum FOSSILIUM, quæ in tractu* Hildesheimenſi *reperiuntur, Deſcriptio, Iconibus illuſtrata, à D.* Friderico Lachmund, *Hildesheimi*, 1669. *in* 4°.

THis Deſcription containing ſeveral things, that may increaſe the Materials for an Hiſtory of Nature, (the compoſure of which is now almoſt every where endeavoured after;) we thought fit, among other Writers of this kind, to take notice alſo of this Author, who delivers what he hath met with in the Country above-mentioned in four Sections.

In the *Firſt* he diſcourſeth of the *Earths* there found, as Marles, Clays, Fullers Earth, Tripoli, Black Chalk, a Vermilion Earth, (melting like butter upon the tongue) and Oker.

In the *ſecond*; of *Concrete Juices*, as Salt, Niter, Alum, Vitriol, Sulphur, Bitumen, and this latter, (to which he refers the *Succinum* or *Amber* ſo copious in *Boruſſia*,) he ſaith is there digged out in a certain hill, called *Deſter*.

In the *third*; of *Stones*, eſpecially Spars, Touch-ſtones, Marble, the *Lapis Specularis*, Blood-ſtone, *Schiſtus*, *Lapis Samioides*, Chryſtal, *Brontia* and *Ceraunia* (vulgarly called Thunder-ſtones,) ſeveral ſorts of *Belemnites's*, ſome of which being rubbed ſmell like burnt Horn; Eagle-ſtones; *Cornu Ammonis*; various ſhells petrified; *Trochites's*, which being put in vinegar raiſe bubles like the *Aſtroites*; Stones repreſenting Flower de Luces; divers Angular ſtones; Stones reſembling Trees; a foſſil Ebony; whole Columns of dropping lapideſcent water congealed, of the thickneſs of a man; *Oſteo colla* growing in a ſandy ground, ſometimes like coral, and at its firſt coming out of the Earth friable, but by degrees growing hard; foſſil Unicorn and Ivory, commonly hard without, but within ſoft and friable, ſticking cloſe to the tongue, and of a pleaſing ſent:

To all which is added an enumeration of variouſly ſhaped Stones, found in the bodies of Men and Women; among which there is mentioned one, which being taken out of the cheek of a woman, was found to be a Cherry-ſtone, round about incruſtrate with ſtony matter, the Cherry being ſuppoſed to have been forced into the Cheek by a fall, and *there* in proceſs of time thus cruſted over, as hath been ſaid; as alſo very many ſtones come out of the corner of a young Womans Eye.

In the *fourth*, of ſome uncommon *Springs*, among which are related ſome ill ſenting and deadly Springs, whereof one is mentioned ſmelling like rotten Eggs; and another, in which, when cleanſed and renewed, four workmen were killed by its noiſom exhalations, &c.

IV. *De CATARRHIS*, *A.* Rich Lower *M.D.* *in* 8°.

WE mention this Book only to give notice, that 'tis now printed by it ſelf in *England*, to be found at Mr. *Martyn's* Stationer at the *Bell in Pauls Church yard*; referring the Reader for the account of the Contents thereof to *Numb.* 73. where it was ſpoken of, when we ſaw it printed in Holland, together with the Authors Book *De Motu Cordis & Sanguinis*.

V. Goth. Voigtii *DELICIÆ PHYSICÆ*: Roſtochii *A.* 1671. *in* 8°.

THis Author entertains his Readers with divers curious ſubjects, ſuch as are the Bleeding of perſons killed, at the preſence of the Murtherer; the Tears of Crocodiles; the Licking of new whelp'd Bears by their Dams; the Love between Wolves and Sheep; Foſſil Fiſhes; the Caſting of Horns by Dear, &c.

As to the *firſt* of theſe, he ſhews it to be a very dubious and dangerous inference, to conclude a perſon guilty of murther from the eruption of the blood of the ſlain; ſince that *both* a ſufficient natural reaſon may be given for ſuch bleeding, whoſoever be preſent; *and* examples are extant of ſuch an effect, when yet the moſt innocent were by, even a Bridegroom ſitting by his dead Bride, when the blood burſt out of her body.

The *Second* argument is reſolved by diſtinguiſhing meer Moiſture or aqueous drops from *Tears* properly ſo called; which latter this Author adſcribeth to *Rational* creatures alone, as only capable of true grief.

The *third* Inquiry, whether the whelps of Bears are born unſhapen and imperfect; is here anſwer'd in the *Negative*, thoſe young creatures being in truth found no more unfaſhioned and defective in their kind, than others in theirs; and the licking of the ſhe bear being common to her with other animals, that do the like to their young ones.

The *Fourth* is ſo determin'd by this Author, that he pronounceth the wolve's tearing and devouring of ſheep to proceed not from Sympathy or Love, but from the Contrary; it being found, that Wolves often worry many more ſheep, than they can devour; there appearing alſo a manifeſt averſion betwixt them from the ſheep's flying away from wolves,inſtead of which there would be a conſociation,if there were a ſympathy betwixt them. Where a particular Example being recited of a Wolf keeping and defending ſheep ; the thing is attributed to their being bred and fed together,and not to any natural Love.

Concerning the *fifth*,'tis here affirmed, that there are Fiſhes under ground and in mines where waters are found , which may either be naturally met with amongſt earth,or conveyed thither by various accidents,inundation of rivers,abſorption of rivers,earth-quakes, &c. Where ſome relations are inſerted of odd things found under ground ; as of a whole ſhip fit to ſail in the Sea,found A.1594.near *Maeſtrich* under a ſandy hillock ; and of another very old ſhip,found by mine-men A.1462. not far from *Berne* in *Helvetia* under ground, together with its hempen ſails and anchors, &c ; as alſo ſtore of Pine-trees,found in the *Peele* orderly placed under the Earth, which elſe grow in raiſed ground.

Touching the *Sixth*, viz.the Caſting of Horns by Staggs, 'tis here diſtinguiſhed,that Caſtrated Staggs do not caſt their Horns, but Entire ones do ; yet not ſo, as that theſe latter are by good experience known to caſt them every year,though it be generally ſaid and believed that they do ſo; whereas in the mean time 'tis commonly held,that every year in the firſt ſix years ſome addition is made to the branched Horns ; unleſs that be to be underſtood of a greater number of branches,growing every year, for ſo long a time, inſtead of the leſſer number caſt off.

Of this *Caſting*,the Cauſe is alſo here inquired,ſome adſcribing it to ſuch a cauſe, as maketh Leaves fall from Trees,by reaſon of the want of a glutinous moiſture ; others imputing it to their too great Hardneſs, hindring the diffuſion of the copious affluent blood , out of which,being gathered about Autumn,worms in time are bred, which gnawing and thereby exciting the itch make the *animal* rub off its horns againſt ſome Tree ; others refer it to both,as our Author.

Laſtly,of *Falling Stars*,vulgarly ſo called, they being in truth nothing but a Meteor : touching which this Author diſcuſſeth ſeveral Queſtions ; as,How it comes to paſs,that at times the True Star, under which the trajection happens, doth not preſently appear ? Whether thoſe Trajections of Stars do alſo happen in the day time? Why thoſe Stars when they fly through the Air, ſeem to repreſent a long courſe? why the motion of Falling Stars is ſlower at the latter end ? &c.

ERRATA.

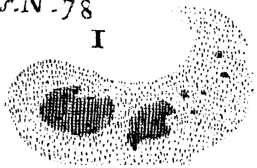
In *Numb.*74.p.2238.l.24.read,*ninth of Auguſt v.ſt* not *n ſt.*

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society.* 1671.

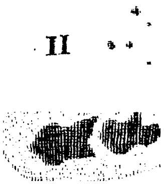
Trans. Nº 78

Tab. 1

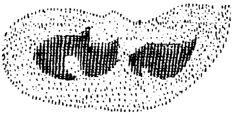
I



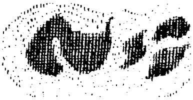
II



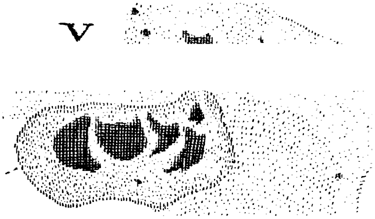
III



IV



V

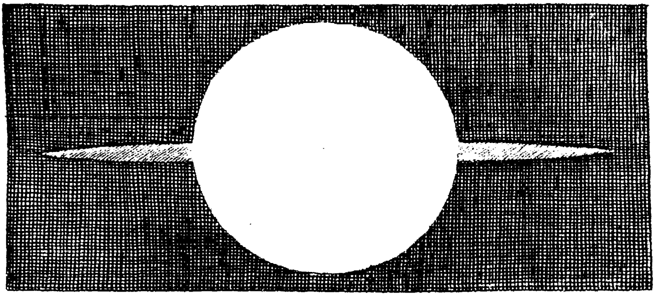


VI

VII

VIII

IX



Numb. 78.

PHILOSOPHICAL TRANSACTIONS.

Decemb. 18, 1671.

The CONTENTS.

Obſervations of the Spots *of the* Sun *continued; and ſome others concerning* Saturn, *and the preſent Diſ-appearance of his* Anſæ *or Arms; made at* Paris. *Extracts of ſeveral Letters; one, of Monſ.* Hugens, *concerning* Saturn: *Two others of Monſ.* Hevelius, *touching* Saturn *obſcured by the* Moon; *a* Lunar *Eclipſe; an Occultation of the firſt of the* Satellits *of* Jupiter *by the ſhadow of this Planet; a Tranſit of* Jupiter *and the* Moon; *and the late Appearance of* Saturn *to the ſame* Hevel. *Another Extract of a Letter from Doct.* Fogelius, *communicating the Obſervations, made at* Hamburg, *of the* returned *Spots of the Sun; together with a Note relating to the late Eclipſe of the Moon. Some Communications of Mr.* John Flamſtead *touching ſome late Appearances of* Saturn. *More Obſervations of Mr.* John Templer *about the Shining of* Glow-worms. *An Accompt of ſome Books:* I. *The ANATOMY of VEGETABLES, begun &c. by* Nehemiah Grew, *M. D.* II. *Diſſertations ſur la Nature du FROID & du CHAUD; avec un Diſcours ſur la Conſtruction & l'Uſage d'un CYLINDRE ARITHMETIQUE; par le Sieur* Petit, *&c.* III. *La DIOPTRIQUE OCULAIRE; par le P.* Cherubin *d'*Orleans.

The Obſervations of the SPOTS *of the* SUN, *made at the Royal Academy at* Paris, *Continued* *; *and Engliſh't out of French.*

HAving formerly communicated the Obſervations of the New *Spots* in the *Sun*, together with Signor *Caſſini's* way of noting their ſcituation in his diſque; which hath ſerved to determine the Time when they ſhould be viſible on its apparent ſurface, and how long they ſhould remain on his hidden Hemiſphere before their re-appearing to us, and laſtly to calculate the duration of their Periodical Revolution about his *Axis*; it may juſtly be exſpected, we ſhould give the Sequele of what hath been obſerved ſince the firſt and laſt appearance of theſe Spots.

It hath been noted in the *firſt* Paper, that in the laſt Obſervation, made the *thirteenth* of *Auguſt*, the Anterior Limb of the Miſty Crown encloſing all the Spots, was in the ſame Horary Circle with the Sun's center.

In the morning of the *fourteenth* of the ſame Month, from ſix to ſeven a clock, there paſſed 15″ of time between the paſſage of the Anterior limb of the ſaid Crown, and the paſſage of the Sun's center through the ſame Horary Circle: And then the Southern limb of the Crown was a *minute* and a *half* diſtant, toward the North, from the parallel of the *Equator*, paſſing through the ſame Center of the Sun. The *Figure* of the *firſt* Spot was almoſt the ſame with that of the day before. The *ſecond* had taken the form of an Heart, the point of which was turned to the North-ſide, and its baſe between the South and the Eaſt. Three other ſmall ſpots, diſpoſed Triangle-wiſe, ſtood over the ſaid baſe, and were accompanied with two others upon a line turned South ward. And they were all encompaſſed by a Crown running out into a point on the South-ſide; and on the North-ſide, Eaſt-ward, it had an *Appendix*, as is repreſented in *Tab.* 1. *Fig.* 1.

The *fifteenth*, at ſix in the morning, there paſſed 27″ between the paſſage of the Anterior limb of the Crown, and that of the Sun's Center through the ſame Horary circle. The Southern limb of the ſame Crown was *two minutes* and *an half* diſtant from the parallel of the *Equator* paſſing through the center of the Sun, whoſe Diameter paſſed in 2′. 9″. through the ſame Horary circle. The firſt Spot had a little changed its figure: the ſecond was quadrangular, longer from Eaſt to Weſt, than from North to South; It appeared bigger than ordinary, and had withall on its ſides, within the compaſs of the Crown, three other ſmall ſpots. There were alſo ſeen four more without the ſaid Crown on the South ſide; as they are marked in *Tab.* 1. *Fig.* 2.

---

* See the Beginning of them in *Numb.* 75.

The *Sixteenth*, at ſix in the morning, there were 27″ between the paſſage of the Suns Anterior limb, and the paſſage of the Anterior limb of the Crown through the ſame Horary circle; and 38″ between the paſſage of the anterior limb of the Crown, unto the paſſage of the Sun's center. The Southern Limb of the Crown was 3½′ off from the parallel of the *Equator*, paſſing through the Center of the Sun towards the North. And the Obſervation having been made yet more exactly at half an hour paſt ſeven of the ſame morning, this diſtance was found of 3′. 33″. The Figure of the firſt Spot in the beginning of the Obſervation differ'd not much from that of the precedent day; but afterwards it was ſeen divided into two. The ſecond, which likewiſe ſeemed to be the ſame in the beginning, was afterwards divided into three, accompanied with black and dark points without the Crown on the South-ſide, as may be ſeen in *Tab.* 1. *Fig.* 3 and 4.

The *ſame day*, at ſix a clock and 15′. at night, the figures of theſe Spots were much changed. They appeared of the ſhape, as we have endeavoured to repreſent them in *Tab.* 1. *Fig.* 5; where there are Five Spots encloſed in the Crown The two fore-moſt were part of that which had been ſeen in the morning as one; the two others following thoſe two firſt, were part of the ſecond in the morning; and without, there were five points on the South ſide; and two more, a little further to the North; which points were ranged as in another *area* made up of other points ſo ſmall, that they could ſcarce be perceived; and the Engraver hath been obliged (to make them perceivable) to repreſent them much greater than they were.

The

The *Seventeenth* in the morning, immediatly after the riſing of the Sun, there appeared three very dark Spots, which form'd in a manner theſe Letters, *F*, *n*, *J*, poſited from Eaſt to Weſt, and included in their wonted Crown, which ſtretched out, as 'twere, two Arms, or two Handles, one to the South, and the other to the North. There paſſed 18″. between the paſſage of the foremoſt limb of the Sun, and that of the foremoſt limb of the Crown, and 47″½ between the paſſage of the anterior limb of the Crown unto the paſſage of the Sun's Center. The Southern limb of the ſame Crown was diſtant 11′. 17″. from the parallel that touched the Sun on the North ſide, and 4′. 38″. from the parallel that paſſed through his Center. See *Tab.* 1. *Fig* 6.

The *Eighteenth*, at ſeven in the morning, the Spots, which appeared through ſome clouds, had almoſt the ſame ſhape with thoſe of the day before, only with this difference, that they were a little cloſer together, drawing from Eaſt to Weſt. There is here no particular deſcription exhibited of them, for fear of failing in their exactneſs, by reaſon of the clouds which hindred to ſee them diſtinctly. There lapſed 13″. between the paſſage of the anterior limb of the Sun, and that of the anterior limb of the Spot, through the ſame Horary circle, and 52″½ of the foremoſt limb of the Spot unto the paſſage of the Center. The Southern limb of the Spot was 9′. 13″. diſtant from the parallel that touched the Northern limb of the Sun, and 6′. 41″. from the parallel that paſſed through his Center. This Obſervation was ended between 7 and 8 in the morning.

At five a clock and 55′. at night of the ſame day, the Spots appeared as in *Tab.* 1. *Fig.* 7. There lapſed 11″. between the paſſage of the anterior limb of the Sun, through the ſame horary circle, and the paſſage of the anterior limb of the Crown, and from thence unto the paſſage of the Suns center, 54″½. The limb of the Crown next to the parallel paſſing through the center of the Sun, was diſtant from the ſame parallel, 7′. 40″.

From four a clock to five in the evening of the *Nineteenth*, the Spot was obſerved whileſt the Sun was emerging out of Clouds. It appeared oblong, near the Suns Circumference; from which it was diſtant about the breadth of the ſame Spot as appears in *Tab.* 1. *Fig.* 8. And when we were preparing to meaſure its diſtance from the parallel of the Diurnal motion of the Suns Center, the Clouds, which roſe from the *Horizon*, intercepted it from our ſight.

The apparent velocity of the Spots, when they approached to the Suns center, (which had been noted in the *firſt* Diſcourſe) gave ground to determin their apparent Periodical Revolution about the Suns Axe about *Twenty ſeven days* and *an half*, ſuppoſing them to be adherent to his Surface, or at leaſt very nigh to it; and conſequently that from the morning of the 13th of *Auguſt*, when they were near his center, they ſhould take between ſix and ſeven days to arrive at the limb of his apparent diſque: the which hath come to paſs conformably to the Obſervations made ſince that time. For, ſince the morning of the 13th unto the evening of the 19th, when they were ſeen nigh the limb, there are 6½ days; and then they were yet ſo far diſtant from it, that it was eaſie to Judge, they would not come out that day. The Clouds and Night did then hinder to obſerve them; but in the morning of the 20*th*, which was not the full ſeventh from the day that they were arrived to the middle of the diſque, they were diſ-appeared. This likewiſe agrees well enough with what had been predicted, *viz*. that theſe Spots during the fourth part of the time of their motion about the Suns center, calculated according to this *Hypotheſis*, and upon the firſt Obſervations, would remain in the *Weſtern* Quadrant.

The apparent Velocity nigh the Center was ſuch, that if it had continued the ſame, the Spots would have arrived almoſt in *four* days to the Limb of the diſque; but in this *Hypotheſis* this apparent velocity was to leſſen according as the Spots ſhould remove from the Center; as hath come to paſs in effect. The diminution of the Length of the Miſty Crown was in a manner proportionat to the diminution of the apparent Velocity; ſince that, when this Crown was in the midle, and in a ſcituation, wherein its true figure could be beſt ſeen, it appeared oblong, and of the form of an human Ear, its greateſt diameter reſpecting Eaſt and Weſt; but being nigh the Limb, this ſame diameter ſeemed to ſhorten; and having appeared greateſt in its firſt ſcituation, it appeared leaſt in this, becauſe it was almoſt in a circle that paſſed through the center of the Sun, whoſe equal arches are by ſo much the more oblique, by how much they approach more to the limb of his diſque, and conſequently appear leſs, according to the rules of Opticks; mean time the diameter,that was turned from South to North, apparently kept the ſame bigneſs it had near the center, becauſe it was in a circle almoſt parallel to the *horizon* of the Sun, which formed the repreſentation of its limb, and whoſe equal arches (by the ſame Optical reaſons) do not appear contracted.

Obſervations concerning Saturn, *made in the ſame place with the former.*

AT the ſame time that the *New Spots* of the Sun began to appear, Signor *Caſſini* obſerved in Saturn alſo ſomething remarkable, in regard of the un-expected Change of his Figure. Aſtronomers know, that this Planet is for the moſt part ſeen with Arms or *Anſes* faſtned to the two ſides of his diſque, when he is beheld with ſome great Teleſcope; and that he retaketh not his *Round Figure*, but every *fifteenth* year. This Change was to come to paſs this preſent year, and Saturn to appear in that Round Figure, without his *Anſes* or Handles, according to the *Hypotheſis* and Predictions of M. *Hugens*, publiſh't *A*. 1659; which indeed hath ſo hapned,but not juſt within the time he had appointed: For this Spherical figure of *Saturn* ſhould not have appeared, according to his ſuppoſitions, but in the month of *July* and *Auguſt*, and ſo continued for the reſt of the time that *Saturn* was to be viſible at this time, and even for a part of his appearance in the next year; but this Roundneſs hath been perceived ſooner, and Saturn hath appeared orbicular ſince the end of *May*, at a time when he was diſtant enough from the Sun and the Horizon, to be well obſerved. He hath remained in this *figure* unto the *Eleventh* of *Auguſt*. The ſaid Signor *Caſſini* did then obſerve him thus; but *three* days after he ſaw him *with Arms*, though very narrow ones;which do ſtill continue *. They are repreſented in *Tab*. I. *Fig*. 9.

* See M. *Hugens's* Letter below.

Monſieur *Hugens* having examined theſe Appearances, and the Cauſe of the difference from what he predicted of them, finds not that they are contrary to his Hypotheſis of the *Flat* Ring about Saturn, by the means of which he explicateth all the Changes of his figure; but he eſteems, that they will ſerve to determine, more preciſely than could be done hitherto, the ſeveral Appearances of this *Round* figure; and becauſe he foreſeeth, that it will ſo appear again within a little time, and at the furtheſt in *December* next, and that the ſame will ſo continue the remaining time of its Appearance, he conſiders the Return of the Arms, which do at preſent appear, as a little interruption of this *Round* figure; which would not ſo much as have been perceived with midle-ſized Glaſſes of 6 or 7 feet, like thoſe that were uſed by *Galilæi* and *Gaſſendi*: which Experience may verifie, if inſtead of Teleſcopes of 15 or 20 feet long, you employ only ſome of theſe ſmaller ones, with which you are not able to diſcern theſe Arms becauſe of their tenuity, and that they are but faintly illuminated by the Sun-beams, which do more obliquely fall upon the *flat* ſurface of the Ring.

Monſieur *Hugens* believeth alſo, that *Saturn* will appear the next Summer, after his Conjunction with the Sun, with Arms like thoſe he hath now; in which he amends his Prediction of *A.* 1659; having ſeen by theſe laſt Obſervations (as he was already aware of it in his *Syſteme*,) that this Round appearance is to be defin'd to a leſs number of degrees than he had done, in reſpect of great Teleſcopes.

An Extract of a Letter, written at Paris *Novemb.* 7. 1671. (ſt.n.) *by Monſieur Chriſtian* Hugens de Zulichem *to the Publiſher; concerning the Obſervations of* Saturn *mentioned in the next foregoing Diſcourſe: Engliſh't out of* French.

S I R,

THere is ſomething indeed, that hath kept me, week by week, from writing to you; which is the Printed paper, accompanying this Letter. For the Obſervations of *Saturn*, therein contained, I had deliver'd two Months ago; but Signor *Caſſini*, purpoſing to publiſh at the ſame time the ſequel of his Obſervations of the *Solar Spots*, the Engraving, and other circumſtances have cauſed ſuch a retardment, that all this appears not till now, and that to my great regret, becauſe having predicted the Return of the *Round* Figure of Saturn towards the End of this year, there wants but little but that the Prediction is accompliſh't before others have been advertiſed thereof. I ſay this as to Forraign Countries; for our Philoſophers here know very well, that as ſoon as Signor *Caſſini* had told me, that the *Arms* of *Saturn* were returned, I ſaid, that aſſuredly they would diſ-appear before the End of this Year. I ſtill obſerved them yeſterday in the evening, but they were ſo faint and obſcure, that it was hard to diſcern them; ſo that within a few days they will appear no more at all. This confirms altogether my *Hypotheſis* of the *Ring*, which now diſappears in proportion that the rays of the Sun do obliquely illuminate the *flat* ſurface of it, obverted to our ſight. And the Appearances of this year give occaſion to predict the Return of the *Round* figure with much more exactneſs, than before.

An Extract of two Letters of M. *Hevelius*, of *June* 19. and of *Octob.* 7. 1671; containing ſome of his late Celeſtial Obſervations, touching *Saturn* obſcur'd by the *Moon*; a *Lunar* Eclipſe; and an Occultation of the firſt of the *Satellits* of *Jupiter* by the Shadow of *this* Planet; a Tranſit of *Jupiter* and the *Moon*; and a late Appearance of *Saturn*: All here deliver'd in the Language, wherein the Author communicated it.

NUper, 1. Junii *ſt. n. rurſus* Saturnum *à* Luna *tectum mihi ex voto annotare obtigit: Initium Occultationis accidit horâ matutinâ hîc* Dantiſci 3.38′.27″. *circa* Montem Germanicianum. *Linea Itineraria, quantum ex ſolo ingreſſu haud obſcurè colligere licuit, tranſiit per M.* Ætnam; *centrum ferè Lunæ, per M.* Herminium, *M.* Herculis, *& ſuperiorem partem* Maris Caſpii. *Erat ſpectaculum multò jucundiſſimum, Sole oriente, Saturnum occultari, ac Tubo 20. ped. appulſum diſtinctè admodum animadvertere; facies tamen Saturni genuina, ejuſque annuli, eo Tubo, eóque tempore, haud ſatis accuratè, ob diluculum Solemque Horizonti adeò vicinum, apparuit: hinc etiam Saturni exitum, ut ut omnem admoverim lapidem, neutiquam deprehendere mihi licuit; præſertim cùm Sol ad duodecim propemodum gradus jam elevaretur. Nihilominus meritò nobis gratulamur, quòd hanc rariſſimam occultationem Saturni nobis obſervare obtigerit. Ego, quantum memini, bis tantum, ſi hujus anni obſervationem excipias, intra 41. annos, Saturnum à Luna tectum vidi; Anno nimirum* 1630. *die* 29. Junii, *veſp. hor.* 11. *cùm in freto Danico circa Inſulam* Huennam *verſarer: Rurſus Anno* 1661. *die* 3. Auguſti *hic* Dantiſci *hora* 7.58′.20″. *veſp. Nam etſi tales Occultationes ſæpius contingant, non tamen ſemper ſerenitas Cæli affulget, ut eas obſervare poſſimus, nec momentum Conjunctionis in noſtro ſemper accidit Horizonte.*

Eclipſis Lunæ Totalis A. 1671. Sept. 18. ſt. n. obſervata *Gedani* à *Joh. Hevelio*, ſolummodo ſub finem.

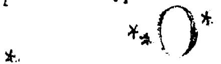
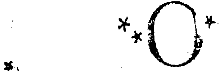
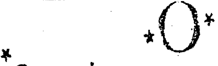
AD *hanc obſervationem* Eclipſeos Lunæ totalis *cum mora veſperi ingruentis ſummâ alacritate nos accinximus, præ primis cùm non ignorarem, Præcellentes viros, diverſis in locis, ſummâ diligentiâ pariter eam obſervaturos. Sed tota die ab ortu ad occaſum, imò ad horam 8. 30′. uſque, pluviæ affatim inceſſerunt, ut nihil quicquam de Lunæ exortu, occaſuque Solis, nec de initio Eclipſeos, totalique obſcuratione deprehenderimus, ut ut avidiſſimè ea omnia exſpectaſſemus. At hora 8. 30′. per nubes dehiſcentes, ſatis tamen craſſas, Lunam ſubobſcurè animadvertimus, & quidem tanto lumine jam imbutam, ut dixiſſes, Eclipſin jam eſſe præteritam. Quandoquidem ob illas denſiores nubes non dabatur, neque nudo oculo, neque armato bene longis & præſtantiſſimis Teleſcopiis, 20.* viz. *pedum, Lunam rectè diſcernere; An ſcil. Luna jam lumen ſuum omninò recuperaſſet, an vero tantùm particulâ aliquâ gauderet? nihilominus ſatis ſuperque exinde certum erat, totalem obſcurationem jam minimùm eſſe eo tempore præteritam, imò aliquanto adhuc citiùs: Siquidem Lunam rurſus adeſſe nos omnes per nubes illas ſatis dilucidè deprehendimus; qua de re eo tempore haud parùm mirabar; quippe ſciebam optimè, Calculum Rudolphinum Initium hujus Eclipſeos hîc* Gedani *indicaſſe Hor. 6. 17′. 19. totalem Immerſionem Hor. 7. 14′. 25″; maximam Obſcur Hor. 8. 10′. 26″; emerſionem Hor. 9. 6′. 27″. & finem Hor. 10. 3′. 33″. Ex eo vero phænomeno elucebat, hor. 8. 30′. jam Lunam minimùm aliquid luminis recuperaſſe; quod tamen calculo, ultra dimidiam horam, adverſabatur: Sic ut Eclipſis in Cœlo multò citius ingruerit, quàm* Kepleri *Calculus id indicaverit: De quo etiam brevi poſt adhuc certiores facti ſumus. Nam nubibus aliquanto diſſipatis, animadverti, Hor. 8. 34′. minimùm ad integrum digitum jam extra umbram ſeſe Lunam extricaſſe; & denuo hor. 9. 41′. ad 1½ dig. lumen Lunæ jam excreviſſe, quantum id dijudicare circiter dabatur. Certò enim dictas phaſes definire, & ſecundùm Maculas delineare, neutiquam nubes obſcuriores pluviæque permiſerunt; quandoquidem nec meliori Tubo ne unicam quidem maculam diſcernere potuimus. Deinde ab hoc tempore obſcuriſſimæ nubes, pluviâque ſatis denſa rurſus totum Lunæ* *adſpectum nobis planè eripuerunt, ut nihil amplius de hac notabili Eclipſi (neque phaſes ullas, neque ipſum finem) annotare potuerimus, præter ea leviuſcula, quæ commemoravimus: Quæ tanti non ſunt, ut ad differentiam Meridianarum rectè cognoſcendam vel determinandam aliquid (uti quidem à nobis omnibus conſtitutum erat) contribuere poſſint. Interea tamen abunde ad id ſufficiunt ut oſtendant, Eclipſin hanc citius revera incidiſſe, quàm calculus* Rudolphinus *oſtenderit.*

Occultatio Primi Jovialium ab umbra Jovis.

C*UM Anno* 1671. *die* 25. Sept. *ſt. n. manè ex condicto* **Dn.** Caſſinus *Pariſiis, & Dn.* Picard *Uraniburgi ſuſcepiſſent, ad occultationem Primi* Jovialium *attendere, volui haud minus ego huic* **Phænomeno** *diligenter invigilare; ſed frequentiſſimæ nubes ab hora* 2. *ad h.* 4. 27'. *impedivêre, quò minùs* Jovem *vel ſemel quidem conſpexerim. At ubi emicuit, deprehendi, adhuc* 4 Joviales *omnes adeſſe, tres ſc. à lævâ, & unum ad dextram. Duo illi propinquiores ad ſiniſtram haud procul videbantur à limbo* Jovis, *non minus ille, qui ad dextram apparebat, aliorum Comitum minimus. Hærebam autem initio, quinam duorum illorum viciniorum occultari deberet, cùm ferè pari interſtitio à* Jove *removerentur, tum motu propemodum tardiori incederent. Hinc dubius ferè eram, an etiam eo ipſo tempore matutino, appropinquante jam aurorâ, umbram aliquis incurrere poſſet. Quippe ad quintam uſque & 7'. ferè, omnes quatuor (ut ut cœlum jam liveſceret, atque* Joviales *ob leviuſculas nubeculas ægrè interdum ſpectarentur) diſtinctè apparebant. Præter tamen omnem ſpem, Hor.* 5. 12'. *videbatur mihi propinquior ille Comes ad lævam (reſpectu Tubi mei, qui inverſo ordine objecta exhibet) penitùs evaneſcere, remanentibus illis tribus, quanquam ille dexterior magis magiſque etiam ad* Jovem *accedebat. Ab eo tempore, quouſque ob cœlum planè nubilum adſpectus Jovis mihi concedebatur, hor. ſcil.* 5. 23'. *haud plures, quàm 3 deprehendi, in ſimili conſtitutione, ut ſub* N° 3 *vides. Illi comites ad Siniſtram abunde micabant, imprimis ille vicinior, qui ſocium amiſerat; alter vero ad dextram, vix ac ne vix conſpectus, ob auroram jam bene adultam. An planè momentum ipſum temporis id fuerit immerſionis illius Comitis, vix auſim adeò certò aſ-*

firmare; nihilominus tardius non incidit illa occultatio; ſed anne unico minuto ferè, adhuc citius fortè, ingruerit, facile conceſſerim. *Menſe* Octobri & Novembri *cumprimis, quando* Jupiter *à Sole erit remotior, puto poſſe accuratius illa Phænomena animadverti.*

Utrum autem æquè benè hæc Phænomena ad inveſtigandam differentiam Meridianorum *conducant, ut quidem Occultationes* Fixarum *à* Luna, *habeo fere cur dubitem; præprimis ob minus tardum* Jovialium *motum; quòd hiſce menſibus fere ſemper in aurora obſervari debeant, quæ magno eſt impedimento accuratis obſervationibus, ut ut etiam accuratiori Tubo, (quemadmodum & ego hac vice Teleſcopio* 20. *ped. uſus ſum,) peragantur.*

Sec.hor.amb. mane.	*A.* 1671. *Sept.* 25. *ſt. n. Immerſ. Primi Jovial in Umbram ♃.*	*Diſtantiæ & Altitudines.*	*Quo inſtrumento.*	*Tempus correctum.*
Hor. , "		° ' "		*H.* , "
4. 36. 25.	*Jupiter primum conſpectus.*		*Tubo* 20 *ped.*	4.32. 0.
4. 42. 40.				4.38. 0.
4. 51. 5.				4.47. 0.
5. 7. 25.	*Altitudo Procyonis.*	34.43. 0.	*Quadr. Orich.*	5. 2. 7.
5. 11. 0.			*Tubo.*	5. 7. 5.
5. 16. 35.	*Primus Jovialium evanuit.*			5.12. 0.
5. 17. 5.			*Tubo.*	5.13. 0.
5. 21. 0.				5.18. 0.
5. 26. 5.	*Altitudo Procyonis.*	36.39. 0.	*Quadr. Orich.*	5.23.27.

Jovis & Lunæ Tranſitus, A. 1671. die 30. *Septemb.* ſt. n. manè obſervatus *Gedani* à *Joh. Hevelio.*

UT*ut Ephemeridum Scriptores ad diem* 30. Septemb. *Occultationem* Jovis *à* Luna *fore* Americanis *ſolis conſpicuam prædixerint; nihilominus tamen hîc* Gedani *ego invigilare huic Phænomeno volui, ratus, ſi Cælo ſereno & bene longis ac præſtantioribus Teleſcopiis uterer, fore, ut ea non minus à nobis* Europeis, (*ſi non noctu, ſaltem interdiu*) *quàm* Occidentalioribus, *dummodò vigilaremus, conſpiceretur, licèt orto jam Sole ipſa Conjunctio, horâ ſcil. 7. matutinâ, juxta Calculum* Rudolphinum *incidat. Proinde ſudo admodum Cælo,* Lunam *protinus orientem, nec non paulò pòſt* Jovem, *Tubo* 20. *pedum ſummâ aviditate excepimus, atque deprehendimus Octante noſtro permagno Orichalcico,* 9. *ferè pedum radio,* Jovem *à* Lunæ *limbo Orientali adhuc* 1. *gr.* 23′. 40″. *eſſe remotum;* Jovialeſque *omnes quatuor à dextra, à qua Luna accedebat, adeſſe, eo propemodum ſitu, quem Delineatio oſtendit. Si aliquanto citius incidiſſet Conjunctio, atque calculus non aberraſſet, jucundiſſimum fuiſſet ſpectaculum, omnes* Joviales *ſucceſſivè unum poſt alterum à* Luna *abſorberi. Sed nulla fuit* Occultatio, *ut exitus docuit, ſed arctiſſimus tantùm accidit* Tranſitus, *Lunæ ſcil. falcatæ decreſcentis, tenuique admodum lumine ſplendentis. Cæterùm, quò accuratius hoc Phænomenon animadverterem, complures diſtantias,* Jovem *inter &* Lunæ *limbum Orientalem, lucidiorem nempe, ſum ſcrutatus, primùm permagno illo, quem dixi, Octante, quouſque Solis præſentia id concedebat; deinde Tubo, & conjecturâ, meliori quo licuit modo, ſum aſſecutus ſicut & ipſâ Obſervatione vides. Initio quidem dixiſſes, fore* Jovem *reverâ tectum à parte* Lunæ *Auſtrali; ſed cùm ipſa* Jovem *proprius accederet, clarè admodum vidimus, Sole licèt jam orto,* Lunam *ſupra* Jovem *tantummodò tranſituram. Ipſum quidem Conjunctionis momentum inſperatus quidam Caſus infelicior deprehendere prohibuit. Cùm enim* Jupiter *ad limbum* Lunæ *orientalem ad* 3′ *jam accederet, atque ad* 6′ *duntaxat à linea Conjunctionis, per utrumque Cornu ductæ, diſtaret, ecce ſupervenientes nubeculas, quæ tam* Jovem *quàm ipſam* Lunam, *nobis è conſpectu, magno noſtro dolore, eripuerunt; ſecus enim op-*

Vid. *Tab.* 2. *Fig.* 1.

V. *Fig. eandem.*

timè & perquam diſtinctè ipſum Conjunctionis punctum obſervaſſem: quandoquidem (quod ſane miraberis) & Lunæ *corniculatam faciem, utpote tertiâ tantum ante Solis conjunctionem die, &* Jovem, *Sole licèt ad* 8 *vel 9 grad. elevato, optimè & accuratè conſpeximus; quippe brevi pòſt, cùm cælum rurſum ſudum fieret, aliquoties, imò continuò quouſque libuit, &* Jovem & Lunam *ſumma cum jucunditate contemplati fuimus. Profectò phænomenon hoc, ut oppidò rarum, ſic fuit obſervatu digniſſimum; eoque magis, quo diurno tempore accidit: Qualium Obſervationum, ut ut ſint rariſſimæ, tres tamen ipſe, unius anni ſpatio, circa* Venerem *ſcilicet,* Saturnum *&* Jovem, *feliciter peregi. Animus quidem erat, circa hunc* Jovis *Tranſitum plures & majores diſtantias* Jovis *&* Lunæ *à Fixis quibuſdam, ob horum Planetarum loca eò accuratius obſervanda, ex ipſo Cælo depromere; at cùm ſtatim Aurora ingruerit, mihique ſoli, cum unico ſocio relicto, omnia peragere, tam Quadrante, Octante, quàm Tubo, incubuerit, in tanto temporis ſpatio, ut harum rerum gnari norunt, fieri illud haud licuit. Ex iis tamen, quæ obſervata fuere, abunde patet,* Tabulas *Aſtronomicas plus promittere, quàm revera adhuc præſtare, ideoque ſeria correctione, non ſecundum Longitudinem modò, ſed & Latitudinem, indigere; quandoquidem Tabulæ Rudolphinæ* Occultationem, *eamque multò citius, promiſere, cùm tamen nulla omninò fuerit, ſed, ut dictum, arctiſſimus ſolummodò ad duos propemodum digitos, tranſitus extiterit, horâ ſcil. 7.26'.0''.*

Facies *Saturni* A 1671. de 11 & 12. *Septemb.* ſt.n. in 17° ♓ obſervata *Gedani à Joh. Hevelio*

A*ER turbidus obſtitit, quò minus poſt* 1 Junii *ad* 11 Septemb. *ne ſemel quidem* Saturnum, *Lunâ ſilente, notare ac delineare potuerim. Quali autem facie tunc temporis (nuper die 11 Sept.) apparuerit, quàm rectiſſimè & diligentiſſimè delineavi,*
Vid. *Tab.* 2. *Fig.* 2
atque hîc tranſmiſi. Oportet, ut vobis eodem tempore ſimili formâ Saturnus *viſus fuerit. An verò menſe* Junio, Julio & Auguſto *eum planè rotundum conſpexeritis, ut volunt* Pariſienſes, *vix mihi imaginari poſſum. Etenim, ut ut brachia Saturni ad latera apparuerint arctiſſima, etiam Tubo 60 & 70 pedum; haud tamen credo, ea omninò evanuiſſe, ita ut ne veſtigium aliquod fuerit reliquum. Fortaſſè* Pariſienſes *Teleſcopiis brevioribus*

in ipſo crepuſculo, Lunâ præſente, Saturnum contemplati ſunt; quo tempore vix ac ne vix datur ſubtiliſſimum illud phænomenon (*uti mihi, primo* Junii, *Tubo* 20 *pedum, Saturnus cùm occultaretur à Luna, obtigit,*) *ritè ac diſtinctè cognoſcere. Scripſi hac de re nuper ad Dn.* Caſſinum, & *Dn.* Picardum; *quid reſponſuri ſint, avidiſſimè exſpecto.*

An Extract of a Letter, written from *Hamburg Novemb.* 1. 1671. by the Learned Doctor *Fogelius* to the Publiſher, concerning the *Spots* of the *Sun* returned; and the laſt *Eclipſe* of the *Moon*; Here communicated alſo in the ſame language, in which it was written.

—*Maculæ Solares iterùm nobis apparuerunt, nunc tamen non amplius viſibiles. Mitto Cl.* Henrici Siferi *Obſervationes, Teleſcopio mediocris longitudinis hic factas. Poſtremis quidem Cælum feliciter favit, adeò ut à primo ferè die, quo iterum apparere cæperunt, aduſque* 5 Septembris, *quo ad Limbum quàm proximè acceſſêre, continuo quaſi filo tum Motus tum Figura earum repræſentari potuerint.*

Æque nos hic, ac Hevelius Gedani, *calculum* Rudolphinum *in nupera Eclipſi, die* 8 Sept. *facta, aberraſſe deprehendimus. Emerſiſſe enim jam* Lunam *ex umbra* Terræ *ante horam nonam etiam hic vidimus. Juxta Calculum modò dictum,* Gedani *emerſiſſe debuerat h.* 9. 6'. 27". *Tempus autem utrobique nubilum Obſervationes utrobique invidit.*

Maculæ in Sole obſervatæ Hamburgi A. 1671.

Diebus menſis Auguſti.
26—*h.* 8. *matut.*
27—*h.* 1. *pomerid.*
28—*h.* 1. *pom.*
29—*h.* 11. *antemer.*
30—*h.* 11. *antem.*
31—*h.* 1. *pomer.*

Et Sept.
1—*h.* 1. *pomerid.*
2—*h.* 2. *pomer.*
3—*h.* 11. *antemer.*
4—*h.* 12. *merid.*
5—*h.* 11. *antem.*
Et h. 4. *pomeridianâ*

V. Tab. 2. Fig. 3.

non amplius viſa eſt mihi H.S.

Extracts of two Letters written from Darby, *Novemb.* 21. *and Decemb.* 2. 1671. *by Mr.* John Flamſtead *to the Publiſher, touching ſome late Appearances of* Saturn.

The *firſt* ſpeaks thus;

—OCtob. 12. laſt paſt, at my firſt viewing *Saturn* with my leſs Tube, I thought I ſaw ſomething on each ſide of him, amidſt the Colours of my Glaſs and the Spurious rays of his Body. Directing my longer Tube (of 14 feet) to him, I could ſee his *Anſes* ſomewhat more diſtinctly, but very ſlender, and to one, that thought not of them, ſcarce diſcernable.

The *other* ſaith;

Laſt Thurſday night, *Novemb.* 30. (the only clear night we have had of late,) I obſerved *Saturn* with my 14 foot Teleſcope, the Aperture being 1½ inch, and its Eye-glaſs drawing two inches. He appeared perfectly round, free from rays and colours, and no *Anſæ* to be ſeen. My worthy friend Mr. *Townly* in his laſt to me, bearing date *Novemb.* 20. 1671, deſireth me to continue the Obſervations of *Saturn*, telling me, that he looked at him one night, and could hardly diſtinguiſh his Line of the *Anſulæ*, but plainly ſaw a dark line through him near his Upper part.

A week or two after the Obſervation of Saturn, which I made Octob. 12. and ſent you in my former, I had frequently the ſame Appearance, though in a wider Aperture, than I uſe at preſent, &c.

Some further Obſervations of Mr. John Templer, *about the ſhining of Glow-worms *.*

I Have now ſent you what my Journal will further afford upon that ſubject, I wrote to you formerly of.

June 1. 71. Upon ſeveral tryalls of different poſitions, I find the Glow-worm not to ſhine ſometimes when in motion, but I could never yet ſee her ſhine, when not in motion of ſome part.

June 8. 1671. after ſome days abſence from home, putting the Glow-worm into an Urinal of white Glaſs at 9 a clock at night, ſhe crawled nimbly in it, and extended her ſelf beyond an ordinary length; yet her ſhining not ſo clear, as in her box when opened: Putting the urinal into the water for about $\frac{1}{2}$ an hour, it gave a very delightful irradiation of the water. When this light ſeemed wholly extinct, although ſhe was in motion, if I depreſſed the urinal into the water, till the bottom almoſt touched the bottom of the baſon, I could (upon looking in at the top of the urinal) ſee a very fair light, but upon lifting the glaſs out of the water, I could diſcern very little ſhining; Then putting her into her box, ſhe did in about a minutes time (for I tryed it twice over by a watch,) almoſt ten times increaſe her former ſhining in the urinal.

June 14. 71. After a ſecond abſence, the worm ſeemed dead, and being ſhut in a box, would give no light through it betwixt 9 and 12 a clock at night; but in the uncovered box, or in the urinal ſhe did ſhine faintly, and the light was of a far different colour from what it was formerly.

June 15. 71. She ſeemed dead. I touched her with a needle gently, whereupon ſhe ſtretched out one of her legs, and by it (when I inclined the poſition of the box) ſhe ſtayed her whole body from falling; whereas before ſhe rowled from one ſide of the box to the other, as I inclined or reclined it. Note, that before I pricked her, ſhe did give a little ſhining in her uncovered box, but none through the urinal; only if you looked in at top, a little ſhining was ſeen. Upon pricking her I did not ſee her ſhining encreaſed.

---

* See *Numb.* 72. of theſe Tracts.

June 16. 71. I diſcerned a little ſhining only within her box; upon pricking I could diſcern no motion in her; but the ſcale next her tayl was ſenſibly *more* extended a ¼ of an hour after I pricked her, than before. NB. Theſe laſt three days, ſhe lay continually upon her back with her legs contracted, except only the time mentioned *June* 15 of my pricking her. I am afraid to conclude her dead. *June* 16, having been informed by M. *Th. Hallebeck* of *Cald Newton* near *Meltan Mawbury*, that he kept a glow-worm near 6 months in his parlour window, which would ſometimes ſeem dead for many *days* together (if I miſtake not, he ſaid *weeks*) and afterwards walk and ſhine both. However I ſhould be infinitely obliged to any one for favouring me with the characteriſtick note of a Glow-worm's being dead 24 hours *before* her ſhining ceaſed, that I might know when to conclude one dead in good earneſt; for I am promiſed in a little time ſome ſtock of theſe Inſects, which, I hope, may give the advantage of further and more ſteady obſervations.

An Accompt of ſome Books.

I. *The* ANATOMY *of* VEGETABLES *begun; with a General accompt of* VEGETATION, *founded thereon: by* Nehemiah Grew *M.D. Fellow of the* Royal Society. 1671. *in* 12°.

THe Ingenious and Learned Author of this Book conſidering with himſelf, that the *Anatomy* of *Vegetables* hath hitherto been much uncultivated, and that yet it very well deſerved the labours of diligent Naturaliſts, hath here attempted to make a very particular Inquiry into the Conſtitution and Structure of Plants, and thereupon to found a rational Diſcourſe concerning the Nature of Vegetation. Which being undertaken by him, he advertiſeth thoſe that ſhall think fit to examine theſe Obſervations of his, not only, that they begin, and ſo proceed till they end again, with the *Seed*; but alſo, that they confine not their Inquiries to one time of the Year, but to make them in ſeveral Seaſons, wherein the Parts of a *Vegetable* may be ſeen in their ſeveral Eſtates: And then, that they neglect not the *Comparative* Anatomy, confronting ſeveral Vegetables and their ſeveral parts together.

The Method he chuſeth in the proſecution of this ſubject, is the Method of Nature her ſelf, in her continued *Series* of Vegetations, proceeding from the *Seed* ſown, to the formation of the *Root, Trunk, Branch, Leaf, Flower, Fruit*; and laſtly, of the *Seed to be ſown again*, or in its ſtate of Generation.

Diſcourſing of the *Seed* as Vegetating, he diſſects a *Garden-Bean*, and ſhews the two *Coats* thereof; the *Foramen* in the outer *Coat*; and what is generally obſervable of the *Covers* of the Seed. This done, he diſplays the proper Seed it ſelf, and therein finds three conſtituent and as 'twere Organical parts of the Bean, *viz.* the Main Body, always divided into two Lobes (though in ſome few other ſeeds into more;) and two other appendant to the *baſis* of the Bean; whereof the *one* is called by him the *Radicle*, being that, which, upon the vegetation of the Seed, becomes the *Root*; the *other*, the *Plume*, which becoms the *Trunk* of the Plant; and being divided at its looſe end into divers pieces, (all very cloſe ſet together as *Feathers* in a bunch) theſe pieces are ſo many true and already form'd, though not diſplayed, *Leaves*, intended for the ſaid Trunk, and foulded up in the ſame plicature, wherein, upon the Bean's ſprouting, they do appear. Theſe Organical parts he finds compoſed of theſe Similar ones, *viz.* 1. the *Cuticle*, extending it ſelf over the whole Bean, and herein diſtinguiſht from the *Coats*, that whereas *theſe*, upon ſetting the Bean, do only adminiſter the ſap, and then die; the *Cuticle* is with the Organical parts of the Bean nouriſh't, augmented, and co-extended. 2. The *Parenchyma* it ſelf, having ſome ſimilitude to the pith, while ſappy, in the roots and trunks of plants; common *to*, and the ſame *in*, the Lobes, Radicle and Plume of the Bean. 3. The *Inner Body*, diſtributed throughout the *parenchyma*, but withall eſſentially different from it; called by the Author the *Seminal Root*, and diſtinguiſh't from the *Radicle*, in that the former is the Original root within its ſeed, the latter is the Plant-root, which the *Radicle* becoms in its growth; the *parenchyma* of the ſeed being, in ſome reſemblance, that to the *Seminal root* at firſt, which the *mould* is to the *Plant-root* afterwards; and the *Seminal root* being that to the *Plant-root*, which the *Plant-root* is to the Trunk. Having viewed theſe parts, he inquireth into their *Uſe*, and in what manner they are the Fountain of Vegetation, and concurrent to the Being of the future Plant.

Proceeding to the *Root*, (which he finds ſubſtantially one with the *Radicle*, as are the Parts of an Old man with thoſe of a *Fœtus*,) he therein obſerveth its *Skin*, *Cortical Body*, and *Lignous part*, together with the Original of each of theſe, and the *Pores* of the two latter, and their proportions; as alſo the *Pith*, and its Original, ſometimes from the *Seed*, ſometimes from the *Cortical Body*, together with its *Pores*, and Proportions: Moreover, the *Fibres* of the *Lignous* body diſperſed through the pith, and the *Cavity* and *Pith* of thoſe Fibres. Where he explains, How the Root grows, and what is the Uſe of its parts; how it grows in length, and breadth; and how it deſcends; adding the Uſe of the *Pith*, *viz.* for the better advancement of the *Sap*, and its quicker and higher Fermentation, begun in the

Cortical Body, inſerted through the *Lignous part*, by which Inſertions the Sap, like the Bloud of the diſſeminations of the *Arteries*, is conveyed to its intimate parts: Our Author conjecturing, that the deſign, whereto all theſe parts are together concurrent, is the *Circulation* of the Sap.

Having thus declared the degrees of *Vegetation* in the *Root*, he next ſhews the Continuance thereof in the *Trunk*; the obſervables and parts of which are, 1. The *Skin*, derived from the *Cuticle* of the Seed: 2. The *Cortical Body*, originated from the *parenchyma* of the Seed: 3. The Lignous Body, being the Prolongation of the *Inner Body*, diſtributed in the *Lobes* and *Plume* of the Seed: 4. The *Inſertment* and *Pith*, proceeding alſo from the *Plume*, as the ſame in the *Root* from the *Radicle*; ſo that, as to their Subſtantial parts, the *Lobes* of the Seed, the *Radicle* and *Plume*, the *Root* and *Trunk*, are all one. Here notice is taken of the Shooting of the *Lignous body* in breadth; wherein are obſervable its *Fibres*, Production of *Rings*, and eſpecially *Pores*; and *theſe* of three ſorts, greater, leſſer, and leaſt of all; all continuous and prolonged by the length of the Trunk: which he proveth by an Experiment made by Mr. *Hook*, by filling up (ſuppoſe in a piece of *Char-coal*) all the ſaid Pores with *Mercury*, which appears to paſs quite through them, as is viſible by a good Glaſs. The reſult of all is, that the *Woody* part of a Vegetable is nothing elſe but a Cluſter of Innumerable and extraordinary ſmall Veſſels or concave Fibres. He farther ſhews the *Inſertions* of the *Cortical body* in the *Trunk*, and the *Pores* of thoſe Inſertions; in none of which *pores* he could obſerve any thing, that may have the true nature and uſe of *Valves*; the non-exiſtence of which he is aſſerting. He diſcourſes alſo of the *Poſition* and Tract of the Pores: and concludeth this Chapter by declaring, How the *Trunk* aſcends; How its parts, in conſequence of that Aſcent are diſpoſed; How that diſpoſition is conſequent to the different nature and energy of the *Sap*; what the effects are of that difference; which way, and how the *Sap* aſcends, *viz.* by the joynt ſubſerviency of the *Lignous* and the *Cortical Body* in ſome, but in moſt, and principally, of the *Lignous Body*, and *Pith*; the latter being here conſider'd as a Curious *Filtre* of Nature's own contrivance: where he examins, *How* the *Pores* of the Pith are permeable; and renders a reaſon, why a piece of *dry Elder-pith*, ſet in ſome tinged liquor, the liquor doth not then penetrate the Pores, ſo as to aſcend through the Body of the *Pith*? To this part is annexed, by way of *Appendix*, ſome Conſiderations of the *Trunk-Roots* and *Claſpers*, and the Uſe of both.

After this, he proceeds to the *Germen*, *Branch*, and *Leaf*, and finds in the two former the ſame parts with thoſe of the Trunk, *viz*. the ſame Skin, and the ſame *Cortical* and *Lignous* Bodies, as alſo the ſame *Inſertment* and *Pith*, here-into propagated, and diſtinctly obſervable in it. Further, he ſhews the manner of their growth, and nutrition, and how the *Germen* is ſecured; as alſo the Uſe of the *knots*. Then he lays open the parts of a *Leaf*, and explains the Poſitions of the Fibres in the Stalks of Leaves, and the Cauſe of their different ſhape, and of their being flat. Then he diſcourſes of the *Foulds* of Leaves, their kinds and Uſe, together with the Uſes of the *Leaf* it ſelf. To this Chapter alſo he makes an *Appendix* of *Thorns*, *Hairs*, and *Globulets*, explaining both their Conſtitution and Uſe.

Next, he gives an Accompt of the *Flower*, and its three general parts, the *Empalement*, the *Foliation*, and the *Attire*; explaining the formation, nature, and uſes of all three, but moſt particularly of the *Attire*, which he finds to be of two kinds, *Seminy* and *Flory*; the *Seminy*, made up of two parts, *Chives* and *Semets*, the latter of which are hollow, yet not ſo but that they are filled up with minute particles, like a powder. The *Florid* Attire is commonly called *Thrumbs*, which are ſeveral *Suits*, of which this *Attire* is made up: The *outer part* of every *ſuit*, is its *Floret*, which is the Epitome of a *Flower*, and, in many Plants, all the Flower. The *next* part is from within its *Tube* brought to ſight, and is called the *Sheath*, likewiſe concave. The third part and the innermoſt of the *Suit* is the *Blade*, which is ſolid, yet at its point evermore divided into two halves; upon which diviſion there appears a *Powder* of *Globulets*, of the ſame nature with thoſe of a *Semet*. The Uſe of the *Attire* he aſſigns to be not only Ornament and Diſtinction to us, but alſo *Food* to a vaſt number of little Animals, who have their peculiar proviſions ſtored up in theſe *Attires* of Flowers; each Flower becoming their Lodging and their Dining-room, both in one: Though it cannot as yet be determined, Wherein the particular parts of the *Attire* may be more diſtinctly ſerviceable, this to one Animal, that to another; or to the ſame Animal, as a *Bee*, whether this for the *Honey*, another for their *Bread*, a third for the *Wax*; or whether all do only ſuck from hence ſome *Juice*, or ſome may not alſo carry ſome of the parts, as the *globulet*, wholly away, &c.

In the following *Chapter* he treats of the *Fruit*, conſidering the Number, Conſtitution, and Original of the Parts of an *Apple*, *Bean*, *Plum*, *Nut*, and *Berry*; and obſerving, that the general Compoſition of all Fruits is one, that is, their *Eſſential* and *Vital* parts, are in all the ſame, and but the Continuation of thoſe, which in the other parts of a Vegetable he hath already taken notice of. To which he ſubjoyns the *Uſes* of Fruits, both for *Man* and *Beaſt*, as alſo for the *Seed*; to which latter it ſerveth for ſupply of Sap, and for Protection and Security, the whole Fruit being, by comprehenſion, that to the *Seed*, what the Hen, by Incubation, is to the Egg or Chick.

In the *Laſt* Chapter he conſiders the *Seed* again, but in its ſtate of *Generation*; as he before examined it in its ſtate apt for *Vegetation*: where occurs, what in the other ſtate was either not diſtinctly exiſtent, or not ſo apparent, or not ſo intelligible. As firſt the *Caſe* of the Seed, and its *outer* Coat, their figures, various ſurface and Mucilages; together with the nature of the *outer* coat and its original: Then, the original and nature of the *inner* coat, in which the *Lignous Body* or *Seed branch* is diſcribed. Whereupon he obſerveth, that all the *Parts* of a Vegetable, the *Root*, *Trunk*, *Branch*, *Leaf*, *Flower*, *Fruit*, and *Seed*, are ſtill made up of two ſubſtantially different Bodies; and that, as every *part* hath two, ſo the *whole* Vegetable, taken together, is a Compound of two only, and no more; all properly *Woody* parts, *Strings* and *Fibres*, being one *Body*; all ſimple *Barks*, *Piths*, *Parenchyma's* and *Pulps*, and, for ſubſtance, *Pills* and *Skins* alſo, all but one Body: The ſeveral parts of a Vegetable differing from each other only by the various proportions and mixtures, and variouſly ſized pores of theſe two Bodies.

But to return, beſides theſe three Covers, he finds a fourth, which is the innermoſt, called by him the *Secondine*, the concave of which membrane is filled with a tranſparent liquor, out of which the *Seed* is formed. Through this membrane, the *Lignous Body* or *Seed-branches*, diſtributed in the *inner* Coat, at laſt ſhoot down-right two ſlender Fibres, like two Navils, one into each Lobe of the Bean: Theſe Fibres, from the ſuperficies of each Lobe, deſcend a little way directly down; and then preſently each is divided into two Branches, one diſtributed into the *Lobes*, the other into the *Radicle* and *Plume*.

As for the *Generation* of the *Seed*, dependent upon the Hiſtory delivered, he ſaith, that the *Sap*, having in the *Root*, *Trunk*, and *Leaves*, paſſed divers Concoctions and Separations, in the manner by him deſcribed, 'tis at laſt, in ſome good maturity, advanced towards the *Seed*. The more Copious and *Cruder* part hereof is again ſeparated by a free reception into the *Fruit*, or other part analogous to it. The more *Eſſential* part is entertained in the *Seed branches*, which being conſiderably long and very fine, the ſap becoms therein, as in the *Spermatick veſſels*, ſtill more mature. From hence it is next deliver'd up into the *Coats* of the Seed, as into a *Womb*, and the *meaner* part hereof is again diſcharged to the *outer* Coat, as aliment good enough; the *finer*, is tranſmitted to the *inner*, which being a *Parenchymous* and more ſpatious body, the *Sap* therefore is not *herein* a meer aliment, but in order to its being farther prepared by Fermentation. The *Sap* being thus prepared in the *inner* coat, as a liquor now apt to be the matter of the future *Seed-Embryo*, by freſh ſupplies is thence diſcharged, or filtred, or tranſpired through the *Secondine* abovementioned; and the depoſiture thereof, anſwerable to the *Colliquamentum* in an Egg, or to the *Semen muliebre*, is at laſt made into the Concave of the ſame. The other part of the *pureſt ſap*, imboſom'd in the *ramulets* of the *Seed branch*, runs a Circle, and ſo becoms, as the *Semen maſculinum*, yet more elaborate. With this pureſt Sap the ſaid *ramulets* being ſupplied, from thence at laſt the *Navel-fibres* ſhoot (as the Artery into the *Colliquamentum*) through the *Secondine* into the aforeſaid liquor, depoſited therein. Into which liquor being now ſhot, and its own proper Sap or tinctures mixt therewith, it ſtrikes it thus into a *Coagulum*, or into a Body conſiſtent and truly *parenchymous*. And in the interim of the *Coagulation*, a gentle *fermentation* being alſo made, the ſaid *Parenchyma* or *Coagulum* becoms ſuch, not of any Conſtitution indifferently, but is raiſed (as we ſee Bread in baking) into a *Congeries* of *fixed Bubles*; the *parenchyma* of the whole Seed being ſuch.

The whole is illuſtrated by ſeveral *Figures*, and theſe explicated with great care.

II. *Diſſertations ſur la Nature du FROID & du CHAUD; par le Sieur* Petit, *Conſeiller du Roy, Intendant des Fortifications, &c. Avec un Diſcours ſur la Conſtruction & l'Uſage d'un* Cylindre Arithmetique, *inventé par le meſme Autheur. A* Paris, 1671.

THe famous Author of theſe two Tracts, examins in the former, *Firſt*, the Nature, Subject, Cauſe, and Effects of Cold. As to its *Nature*, he eſteems it to be a *Poſitive* thing, and not a meer *Privation*, the Effects of *it* being as ſenſible to us, as thoſe of *Heat*. For the *Subject* of it, he placeth the Supreme Cold in the Pure *Air*, and maketh the Heat, that is ſometimes in the Air, meerly adventitious, produced in it by the Sun, but the Cold natural to the ſame. Concerning the *Cauſe* of this Cold in the Air, he will not acknowledge it to be *Nitre*, (all ſorts of Salt being by him eſteem'd hot) much leſs an Univerſal Spirit, or any Stars; but eſteems, that the Air is the *Primum Frigidum* by nature; the ſame Cauſe, that hath made it Air, having made it Cold. The *Effects* of Cold being too obvious to diſcourſe of them in print, he enlarges upon the *Manner* of its operation, performed by the inſinuation of the Air into the pores of Bodies, and increaſed by the force of Northerly winds; where he notes, that the Cold Air, by its parts, figur'd for the purpoſe, and penetrating ſuch bodies as are diſpoſed to glaciation, divides the parts of the ſame, and arreſts their motion. Here he endeavours to prove, that Frozen water is not properly condenſed, though it be hardned and fixed; but that 'tis rather dilated by the ingreſs of the Cold Air; whence he obſerveth that Ice is really lighter than Water.

Secondly, he diſcourſeth of *Fire*, after he hath diſcarded it from being one of the common Four Elements, and diſlodged it from its reputed place above the Air under the Concave of the Moon: And affirms, that 'tis the Heat of the Sun, which moves, quickens, and coagulates the three families of Mixts, Animals, Vegetables and Minerals, yet withall taking in a Subterraneous heat for the production of Minerals.

In the *Latter* Tract of this Book, the Author explains an Invention of his, of an *Arithmetical Cylinder*. For, finding that in the *Rabdology* of the Noble *Nepper*, the multitude and embaraſment of thoſe ſticks, filled with numbers on all ſides, proved longſom and tedious, and that thereupon the practiſe of the Invention had ceaſed; he conſider'd of a way to render it more expedit and eaſie, and at length concluded, to take bands of paſt-board inſtead of ſticks; on which having written the ſelf-ſame *Multiples* from 1 to 9, and made the ſame diſtribution of the numbers into little ſquares, ſeparated by a diagonal, drawn from the left to the right hand upwards, (as thoſe Sticks are;) he added thereto a *file* of *Roman* Numbers, I, II, III, IV, V, VI, VII, VIII, IX, to be put on the ſide, and over againſt the Multiplying and Dividing Numbers; very uſeful as well for marking the beginning and end of the ſaid numbers, to ſtop where 'tis needful (all the bands not being uſed in all operations,) as for marking the *Multiple*, which you ſhall uſe in each number. As, (*e.g.*) to multiply 7 by 5 or by 9, inſtead of being at the trouble of counting the ranks of theſe *Multiples* 5 and 9, they may be preſently ſeen in one or other of the *Files* of thoſe Roman Numbers. Having then employed theſe bands in raiſing or abaſing them on a table, to make thoſe principal numbers, that are neceſſary, to appear over againſt one another, he further bethought himſelf (for a yet ſhorter way,) to diſpoſe thoſe pieces into circles very equal, and to glew, upon each of them, 3 or 4 ſmall buttons of wood, of the bigneſs of a pins-head, and then to put them upon a *Cylinder* of wood or paſt-board, on which they might be turned by means of thoſe buttons: Which form made him call this little Inſtrument an *Arithmetical Cylinder*, which is of the bigneſs or diameter of a Childrens-Drum, or of the form of an Hat, and of what height you will, to hold as many bands or circles as you ſhall deſire to make great Operations.

The practiſe of this Inſtrument is ſhewed by divers Examples, as may be ſeen in the Book it ſelf.

III. *La DIOPTRIQUE OCULAIRE, par le Pere* Cherubin *d'* Orleans, *Capucin. A* Paris, 1671. *in Fol.*

THe Author of this large and elegant Volume, having propoſed to himſelf to comprehend in it and to teach all that concerns the Theory, Uſe, and Mechaniſm of the Teleſcope (by him called the *Ocular Dioptrique,)* divides it into three principal Parts.

The *Firſt* contains the Doctrine of Opticks and Dioptricks, or, of Simple viſion Direct, and that which is made by rays Refracted; both by him pretended to be handled with a ſuccinct, but ſingular, Method.

Diſcourſing of *Refraction,* he declares, That the Refraction of a viſual ray in Glaſſe to 30 degrees of inclination, is proportional to the Inclination of the ray, as far as ſenſe is able to judge of it. And that, the Inclination not exceeding 30 degrees, the Angle of the refraction of the ray, which enters into Glaſs, is about a third part of the Angle of the Inclination of the ray paſſing into the Air: But that the ſame Inclination not exceeding 30 degrees, the Angle of the refraction of the ray iſſuing out of the Glaſs into the Air, is about the half of the Angle of its Inclination in the Glaſs.

Examining, what the Diſſection of an Eye may conduce to the knowledge of the Refractions of its Humors, he noteth, That the Extinction of the vital ſpirits in a dead Animal doth extreamly alter the conſiſtence of the Humors of his Eye, which contributed much to the perfect viſion in the living animal: And that all the Experiments, that can be made by diſſecting of Eyes, to come to the knowledge of the Refractions of the Humors, and of the other parts that conduced to Viſion, cannot give the true knowledge thereof; Experience proving, that the Chriſtallin and Vitreous humors do reciproqually change their conſiſtence.

He obſerveth alſo, that not only the different Diaphaneities of the Humors of the Eye do contribute to the refraction of the viſual rays paſſing thorow them; but alſo the Figures of their Surfaces, on which thoſe rays fall unequally inclin'd. He noteth likewiſe, that the viſual rays, having penetrated the Corneous tunique and the Aqueous humor of the Eye, do not ſuffer any great refractions upon the *Anterior* ſurface of the Chryſtallin, though it be finer than the Aqueous humor; becauſe that its Spherical convexity is con-centrique to that of the *Cornea* and of the *Aqueous humor*, which are likewiſe ſpherical: But that they receive their greateſt refractions, when they paſs through the *Poſterior* ſurface of the Chryſtallin, which is oppoſite to them, and of a very ſmall Sphere, and upon which they are found much inclined.

He taketh further notice, That the ſurfaces of the Chryſtallin humor are not Hyperbolical but perfectly Spherical; and that the exactneſs, which by that means is pretended for Viſion, is contrary to Experience, by which he aſſerts it to be undeniable, that, though by Glaſſes of an hyperbolical figure,the rays, coming from the principal point of the object to the Eye, would more exactly meet in *one* point at the bottom of the *Retina*, and conſequently, that from one certain point of a determinate diſtance you would more perfectly ſee that point ; yet would not ſuch a figure reunite the rays of the other lateral points of the object, each exactly in a point of concourſe in the ſaid *retina*. So that, if the viſible object were nothing but a point, and the ſurfaces of the Chryſtallin hyperbolical,(which they are not,) there would then be made a more exquiſite viſion of that *only* point.

The *Second* part delivers the *Theory* of the Teleſcope in all its kinds : which is uſher'd in by a Hiſtory of the Invention and Antiquity of Teleſcopes; and by a Diſcourſe concerning the Difference of the Ancient Glaſſes from the Modern.

This done, he explains the matter of this ſecond Part in XI. Sections.

1. Shews the power, which diaphanous *medium's*, leſs ſubtile then Air, and of figures ſimply Spherical, have in refracting the viſual rays paſſing thorow them.

2. Declares the Effects of Spherical Convex Glaſſes, to ſerve for the conſtruction of the Teleſcope of the *firſt kind*, which always ſuppoſeth the Eye between the Glaſs, and its point of Concourſe.

3. Conſiders the Affections of Spherical Concaves,to ſerve for the conſtruction of the ſame kind of Teleſcope.

4. Demonſtrates the Effects of the Conjunction of Spherical Convexes and Concaves,in the Conſtruction of the ſame ſort of Teleſcope.

5. Examins the Affections of Spherical Convexes, in the Conſtruction of a Teleſcope of the *ſecond* kind ; wherein the Eye is always more diſtant from the Convex Objective Glaſs, than its point of Concourſe, and which admits no Concave.

6. Shews the Effects of the Compoſition or Multiplication of Spherical Convexes,in the conſtruction of all ſorts of Teleſcopes of the *ſecond* ſort.

7. Demonſtrates, that the long Teleſcopes, which ſerve to ſee remote objects, may alſo ſerve to ſee near objects that are ſmall.

8. Demonſtrates the Conſtruction of Microſcopes, to ſee the ſmalleſt Objects.

9. Shews the Conſtruction of a kind of Mixt or Catadioptrique Teleſcope, compoſed of Refraction and Reflection.

10. Shews, that one may ſee at one and the ſame time, with both Eyes, one and the ſame Object, by a Teleſcope; and how to make ſuch an one.

11. Treateth of the Proportion of the reſpective Convexities and Concavities of Glaſſes, to ſerve for the conſtruction of a Teleſcope.

The *Third* part of this Volume is ſubdivided into two, which the Author calls the *Poſitive*, and *Mechanical*. The *Poſitive* teacheth the actual Conſtruction of Teleſcopes, and their Uſes, and that in 12 Sections.

1. Delivers the manner of proportioning poſitively the Power of Glaſſes for Teleſcopes; together with the choice of their figure, though ſpherical, and the tryal and graduation of their goodneſs.

2. Teaches how to work actually all ſorts of Teleſcopes, and how to uſe them.

3. Teaches the manner, actually to put into uſe the Catadioptrique Teleſcope, which redreſs the object by Reflection, that before had been inverted by Refraction.

4. Shews the way of making a double Teleſcope in all its kinds, to make Objects to be ſeen by both Eyes at the ſame time, much greater and much clearer, than with one Eye alone.

5. Teaches in general, how to make actually all ſorts of Microſcopes, to ſee diſtinctly and to magnifie very conſiderably the ſmalleſt objects.

6. Treats of the Uſe of the Teleſcope generally in all its kinds.

7. Teaches a New and peculiar uſe of Teleſcopes, for

drawing to the life in proportion, from a great to a ſmall volume, any Terreſtrial objects, that are at a competent diſtance to be well ſeen; without a neceſſity of having any skill in drawing.

8. Contains the Uſe of the Microſcope in all its kinds; together with a way of meaſuring, how much a Microſcope magnifies the Object.

9. 10. 11. Treat of the Uſe of Teleſcopes in the Obſervations of *Celeſtial* Objects: Where the Author enumerates the many excellent Diſcoveries, that by their means have been made by modern Aſtronomers, who therefore may be ſaid,

Admoviſſe oculis diſtantia ſidera noſtris,
Ætheraque ingenio ſuppoſuiſſe ſuo.

Such as are, 1. The Conjunction of *Mercury* with the *Sun*. 2. *Venus* having her phaſes like the *Moon*. 3. The Body of the Moon appearing like an other Earth, full of Mountains and Vallies, Seas, Rocks, Iſlands, Lakes, Forreſts and vaſt Plains; as alſo the Libration of the *Moon*. 4. Spots in the Sun. 5. The Four Satellits of Jupiter. 6. A Satelles of Saturn, and Rings about the ſame. 7. Several Belts about Jupiter, and divers Spots in *Mars*, *Venus*, &c. 8. The *Milky way* nothing but an innumerable company of ſmall Stars, near to one another. 9 The finding an Eclipſe to begin and end ſooner when obſerved with the naked Eye, than when ſeen with a Teleſcope; as alſo, that it appears always leſs by a *digit*, being obſerved by the bare Eye, than it is indeed. 10. *Pleiades* conſiſting of many more Stars than *Seven*. 11. *Orion* having 80 other Stars beſides thoſe three in his *Belt*, and the ſix in his *Sword*: And the ſame having in his head 21, inſtead of the one, called the *Nebuloſa*. 12. The Obſervation of many New Stars, as in *Caſſiopæa*, in *Cete*, in *Cygno*, *Andromeda*, &c. Here the Author taketh occaſion to intimate, that the rich Blew of the Sky ſeems to be nothing elſe, but a Confuſion of the mixture of lights diffuſed by that innumerable number of Stars, diſperſed through the whole extent of that immenſe profundity of the Æthereal Region.

12. Teaches a new way, of uſing a Teleſcope for drawing in proportion all the new Appearances in the Heavens; for meaſuring the Bodies of the Planets, and of the Fixt Stars themſelves and their diſtances, in ſuch parts, that a *Line* (the twelfth part of an inch) ſhall contain a 1000 of them; an inch (the twelfth part of a foot) 12000, and a foot, 144000: Beſides, a very eaſie and certain way of making all theſe parts (though very ſmall) perceptible to the bare Eye.

So far of the *firſt* Head of this *Third* Part.

The *other* Head is the *Mechanical*, ſhewing the ſeveral ways of Forming and Poliſhing all ſorts of Glaſſes, that ſerve for Teleſcopes; which is done in *ſix* Sections.

1. Rectifies the *Common* way of forming Glaſſes Spherically, and all the Moulds, in which the Vulgar Artiſts are wont to work them.

2. Teaches a way of excellently forming and poliſhing ſuch Glaſſes by hand, without any Engin.

3. Teaches a way of working Glaſſes by the hand guided by a ſimple Engin.

4. Treats of the working of Glaſſes by Inſtruments and Engins, regulating and directing the hand.

5. Teaches a New way of working Spherical Concave Eye-glaſſes, to ſerve Teleſcopes of the firſt kind, above-mentioned.

6. Teaches a New way of working all ſorts of Spherical Glaſſes, Convex and Concave, for Teleſcopes, very univerſally, ſpeedily, with eaſe, and in a ſmall room; even for the longeſt Tubes.

All which the Author concludeth with a Direction for a way of making Tubes that may ſerve to fit up Teleſcopical Glaſſes.

ERRATA.

In *Numb*. 74. p. 2221. l. 25. r. *is by Bruerus deſcribed to Muffet*.
In this *Numb*. 98. p. 3021. l. 22. r. *predicted*, for *practiſed*. p. 3029. l. 16. *& unum*. ibid. l. 25. r. *ſpectarentur*.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*. 1671.

I

PHILOSOPHICAL TRANSACTIONS.

Januar. 22. 167$\frac{1}{2}$.

The CONTENTS.

A Letter of Mr. Liſter, *containing an Ingenious accompt of* Veins *(analogous to Human Veins) obſerv'd in* Plants. *An Account of the* Loud Speaking Trumpet, *as it hath been contriv'd and publiſh't by Sir* Samuel Moreland, *together with its Uſes both at Sea and Land. An Obſervation and Experiment concerning a* Mineral Balſom *found in a Mine of Italy. Two Obſervations made by P.* Franceſco Lana, *touching ſome of the Effects of the* Burning Concave *made at* Lions; *as alſo an odd Salt of a Metallic ſubſtance. Mr.* Flamſteed's *promiſed* Appendix *of the* Moon's *Appulſes to the reſt of the* Pleiades, *to be obſerved An.* 1672.

An Accompt of ſome Books: I. *Elemens de GEOMETRIE; par le P.* Ignace Gaſton Pardies. II. Regnerus de Graaf *de SUCCO PANCREATICO, & de Partibus GENITALIBUS Mulierum.* III. *Phyſico Matheſis de LUMINE, COLORIBUS & IRIDE; Auth.* Franc. Maria Grimaldo. IV. *De Fabrica TRIREMIUM Liber* Marci Meibomci.

A Letter of Mr. Martyn Liſter, *written to the Publiſher from* York, *Januar.* 10. 167$\frac{1}{2}$, *containing an Ingenious account of* Veins, *by him obſerv'd in* Plants, *analogous to Human Veins.*

S I R,

I Am very much pleaſed, when you give me to underſtand, that ſomthing is publiſhed of the *Anatomy* of *Vegetables*, and that more is deſigned by that excellent perſon Signior *Malpighi* *. And ſince the receipt of your laſt, I have peruſed the very ingenious Book of Dr. *Grew*; and, as far as I have obſerved theſe matters, all things therein are faithfully delivered, and with great ſagacity. In turning over my Notes, made ſome years agoe, I find, among other things of this nature, ſome few Obſervations concerning the *Veins* of Plants or ſuch *Ductus*'s, as ſeem to contain and carry in them the nobleſt juices of Plants. Of theſe there is little or no mention made in this curious *Tractate*, unleſs under the notion of *Pores*. And becauſe I am of the opinion, that they will prove veſſels Analogous to our *Human Veins*, and not meer *Pores*, they ſhall, if you pleaſe, be the ſubject of your entertainment in this Letter; and the rather that, if they prove *Veins* (as I little doubt them) they are not to be paſſed over in ſilence, but are early to be accounted for in the Anatomy of *Vegetables*.

To avoid ambiguity; Thoſe parts of a Plant, which *Pliny* (*lib.* 16. *cap.* 38.) calls by the names of *Venæ* and *Pulpæ*, are nothing elſe, in my opinion, but what our late late Author, Dr. *Grew*, calls *Fibres* and *Inſertments*, or the *Lignous* body interwoven with that which he takes to be the *Cortical*, that is, the ſeveral diſtinctions of the *Grain*. Now, that the veſſels, we are about to diſcourſe of, are not any of the *Pores* of the *Lignous* body (to uſe the *Doctors* terms) is plain in a traverſe Cut of *Angelica Sylveſtris magna vulgatior J. B*, for example; the Veins there

* *This Learned and Accurate Philoſopher hath already preſented to the* R. Society, *in a very obliging manner*, *his* Manuſcript, *containing the Sum of his Obſervations and Labours about the* Structure *of* Plants; *and he hath alſo very generouſly engaged himſelf, that, upon the Apppobation of that Illuſtrious Body, he will enlarge his Papers, illuſtrate all the particulars, therein contained, with* Scheams, *and then publiſh the whole.*

very clearly ſhew themſelves to an attentive view to be diſtinct from *Fibres*, obſervable in the *Parenchyma* of the ſame Cortical body together with themſelves; the Milky juice ſtill riſing *beſides* and not *in* any *fibre*. Alſo in the like cut of a *Burdock* in *June*, the like juice ſprings on this and on that ſide of the *radii* of the Woody circle, that is, in the *Cortical* body and *pith* only. Again, where there is no *pith*, there is none of this juice to be obſerved, and conſequently none of theſe *Veins* as in the Roots of plants, and Trunks of trees; but ever in the *Bark* of either. I need not here enumerate the many Plants, wherein theſe particulars are moſt plainly obſervable, as in *Sphondylium*, *Cicutaria*, many of the *Thiſtle* kind, *&c.*

Further, Neither are they probably of the number of the *Pores*, deſcribed by our Author in the *Cortical* body, or *Pith*. Not ſurely of thoſe *Pores* extended by the *breadth*, becauſe the courſe of the juice in theſe veſſels is by the *length* of the plant; as I have ſometimes very plainly traced in the pith of a dryed *Fennel-ſtalk*, following them by diſſection quite through the length of the pith. It remains, that, if *Pores*, they are of thoſe pores of the *Cortical* body, that are ſuppoſed to be extended by the *length* thereof; which yet ſeems (to me at leaſt) not enough, but we think them veſſels inveſted with their own proper membranes, analogous to the Veins of our Humane body; for theſe reaſons: 1. Becauſe they are to be found in the *Pith*, and ſometime in the *Cortical* body of a plant, not included within the *common* Tunicle of any *Fibres*, as is above noted: (that Fibres, or the Seminal root are cloathed, is moſt plain in ſome plants, as in *Fern* and *Geranium Batrachoides*, the Fibres of the former are coated, at leaſt in ſome parts of the plant, with a black skin, in the *latter* likewiſe with a red one:) And in theſe caſes, had they not, I ſay, their own proper membranes, we ſee no cauſe, why the very porous and ſpongy body of the *Pith* and *Cortex*, ſhould not be in all places filled alike with the juice, and not riſe (as moſt plainly it doth) in a few determinate and ſet places only, that is, according to the poſition and order of theſe veſſels. 2. Again the Experiment I made, which you were pleaſed to publiſh *, concerning the effect of

* See *Numb.* 70. p. 2122, & 2123.

of a ligature on *Cataputia minor Lobel.* viz. the ſudden ſpringing of the Milky juice out of infinite pores beſides the Inciſion: (the cauſe of which *Phœnomenon* I take to be, the diſſected veins impetuouſly diſcharging themſelves of part of their juice within the porous *Parenchyma* of the Bark;) whence it is probable, that, if there was no coated veſſel to hold this milky juice, we might well expect its ſpringing upon the bare ligature, as when we ſqueez a wet Sponge; the external Cuticle of the plant, as this Experiment ſhews, being actually perforated.

In the next place it is very probable, that theſe veſſels are in *all* Plants whatſo.ver. For, as it is truth-like of all the other *ſubſtantial* parts of plants, that they are actually in, and common to all plants, though ſpecified by divers accidents in Figure and Texture; ſo of theſe *Veins*, which, though they be diſcernable moſtly in thoſe plants where they hold *diſcoloured juices*, yet we may very probably think, that they are wanting, where the eye finds not that aſſiſtance in the challenging of them. As in theſe very plants, where they are *leaſt* viſible, there is yet a time when they are, if not in all, yet in ſome parts of theſe plants, plain enough to the naked eye: The tender ſhoots of the Greater and Leſſer *Maple*, in *May*, are full of a milky juice; *viz.* the known liquor of theſe Veins. Again to this purpoſe, If you apply a clean knive blade to a travers cut of the like Shoots of *Elder*, the Gummy liquor of theſe Veins will be drawn forth into viſible ſtrings, as is the nature of Bird-lime, of the bark of *Holly*, or the milk of *Cataputia minor Lobel.* Further, The leaf ſtalks of our *Garden Rubarb* do ſometimes ſhoot (by what accident, we enquire not here) a tranſparent and very pure Chryſtallin *Gumm*, though the Veins, that held this gummy juice, are by no ordinary means viſible in them, and yet by comparing the nature and properties of this Gum, with that of the Gums of other Vegetables, we cannot doubt but this *Gum-Rubarb* is the juice of theſe Veins, as well as we are aſſured, the Gum of other Vegetables to be of theirs, by the ſame comparative Anatomy. Laſtly, we think, that even *Muſhromes* (that ſeemingly inferiour and imperfect order of Vegetables) are not exempt and deſtitute of theſe Veins, ſome of them yielding a milky juice, hot and fiery, not unlike ſome of the *Spurge* kind, or *Euphorbium.*

It might be expected, that I ſhould add, ſome things at leaſt, concerning the Original and Productions of theſe Veins, if not an exact deſcription of them, the courſe of the juices in them, and their more immediate and primary uſes in the matter of Vegetation: But I muſt acquaint you, that (beſides the ſeaſon is not now proper to improve and verifie, if I had leiſure, the Obſervations formerly noted, and that they were things thrown into my *Adverſaria* without other order, than that nothing ſhould ſlip from me in the queſt of Medicaments, that might be of light) although I find indeed many ſcattered particulars (beſides them already delivered) concerning the Poſition, Order, Number, Capacity, Diſtributions, Differences, Figure, &c. of theſe Veins; you will be pleaſed to take in good part, if I think fitting to reſerve them until the opportunity of another Summers review: It ſeeming to me no ſmall matter, to have fairly hinted the exiſtence of them to ſuch curious perſons as ſhall have the leiſure, and find themſelves in better circumſtances, than I can pretend to, as to thoſe great advantages of Glaſſes. Deſigning, &c.

To conclude with the *primary* uſe of theſe *Veins*: which is, in my opinion, to carry the *Succus nutritius* of *Plants*, becauſe, where they are not, there is no Vegetation; as it is ſeen, if an engrafted Branch or Arm be bared and ſtripped off the clay, &c. in *June*, all the courſe of Vegetation will appear to have been made only by the *Bark*, and not by the *Wood*, that is, in the place only, where theſe veins are. A *ſecondary* uſe is the rich furniture of our Shops; for, from theſe *Veins* only it is, that all our *Vegetable Drugs* are extracted, and an infinite more might be had by a diligent enquiry, and ſome eaſy means, which I have not unſucceſsfully put in practice; witneſs the *black Reſin*, I not long ſince ſent you a ſpecimen of.

An Account of the Speaking Trumpet, *as it hath been contrived and publiſhed by Sir* Sam. Moreland *Knight and Baronet; together with its Uſes both at Sea and Land. Printed at* London *An.* 1671.

THe Author of this Inſtrument relateth *firſt* the ſeveral Tryals made with it; of which the moſt conſiderable was, that the biggeſt of thoſe that have been as yet employ'd, turn'd Trumpet-wiſe, being 5 foot 6 inches long, and of 21 inches diameter at the great end, and 2 inches at the little; When by his Majeſties ſpecial command it was tryed more than once at *Deal* Caſtle by the Governour thereof, the voice was plainly heard off at Sea, as far as the Kings Ship's uſually Ride, which is within two and three miles, at a time, when the wind blew from the ſhore.

Next, He diſcourſeth of the Nature of Sounds, and the Manner, How he conceiveth them to be magnified or multiplyed by this Organ. Where he obſerveth, 1. That a ſmall Tube (*e.g.* that of an ordinary Trumpet) does not at all magnifie Sounds, Words, or Syllables. 2. That 'tis neceſſary, the diameter of the leaſt end of one of theſe Inſtruments be equal to (if not greater than) the diameter of the orifice of the Speakers mouth, and that what it wants of that, ſo much the leſs does the Inſtrument magnifie the Voice. 3. That the Inſtrument muſt be enlarged by degrees, and not too ſuddenly. 4. That the Mouth-piece of it muſt be ſo applyed and adapted to the Speakers mouth, that no Air or Breath be loſt, and yet the Mouth have free liberty of opening and ſhutting, that ſo the Articulation be entirely preſerv'd. 5. That the Point, where the voice is moſt magnified, is the Center of its greater Orifice. 6. That the turning and winding of this Inſtrument, either Trumpet-wiſe, or in any other Circular figure, is ſo far from prejudicing it, that it the rather ſtrengthens the voice. 7. That (as he with ſubmiſſion conceives) the Voice, as it is tranſmitted through this Inſtrument from the Mouth, endeavors all the way to ſpread and dilate it ſelf by Spherical Undulations; but finding Oppoſition on every ſide, maketh a percuſſion in every point of each imaginary circle of the Tube; and again, that the percuſſion made in every ſuch Circle, being reundulated to the Center of each of them, maketh there a much ſtronger percuſſion than that which was made in any ſingle point or part of ſuch Circle, foraſmuch as it may be preſumed, that all the percuſſions, made in any of thoſe Circles, are united in their ſeveral Centers; and that the percuſſion in the Center would again dilate it ſelf by a Spherical Undulation, but meeting with oppoſition in every point of the Tube, an entire Cone of imaginary rays of Sound are reverberated to ſome Center, in like manner as the Sun-beams are reverberated from a poliſht ſuperficies of a *parabolical* Concave to its proper *focus*. And that therefore, as the Tube enlarges it ſelf, and the Circles both of Reundulation and Reverberation become greater, there muſt needs be imagined (according to him) a greater number of Reundulating Circles and Reverberating Rays, to meet in each reſpective Center and *Focus*, whereby the ſame voice is greatly augmented. 8. As to the Demonſtrative part of this Tube, and the exact Figure and Dimenſions of it, he propoſeth to Mathematical Philoſophers this Problem, *viz.*

> *What is the Right-lined, Curvi lined, or Mixt Figure; and what are its exact Dimenſions; and what the Sphere of its activity, that beſt and moſt magnifies Human Voyce?*

Laſtly, He ſubjoins the Uſes of this Inſtrument; as, 1. *That* in a Storm, or in a Dark night, when two Ships dare not come ſo near one another as to be heard by any ordinary voice, by this Tube they may very eaſily ſpeak together at half a mile or a miles diſtance, or more, if need be, eſpecially if alternately they take the advantage of the Wind: And if that be ſo ſtrong, that but one of the Ships can ſpeak with the Wind, the other may anſwer by ſigns, though directly againſt it. 2. In a Storm it is of good uſe in a ſingle Ship, for hearing one Man giving order to all in a Ship. 3. By it an Admiral may in a Calm give immediate Orders to his whole Fleet; as alſo a Governour may convey his Orders from a

Sea-Fort to Ships riding at a pretty diſtance in the Road. 4. In caſe of a cloſe Siege, by this Inſtrument, at one, two, or three miles diſtance, the *Beſieged* may be told, by ſpeaking in *Cypher*, that there is Relief coming, and how great, and when: And, on the other ſide, the *Beſiegers* may thereby threaten and diſcourage the *Beſieged*, in a ſpatious Town. 5. By this means a General may ſpeak himſelf to his whole Army; an Herald may make a proclamation, to be diſtinctly heard by many thouſands; an Overſeer of Works, give orders to many hundreds of Workmen, without changing his ſtation; Officers and others, in caſe of a great Fire, where uſually people are in an hurry, may ſo govern the Aſſiſtants as to prevent diſ-order and confuſion; Houſe-keepers, in caſe of Thieves attacking an Houſe remote from Neighbours, may immediately call upon all the Dwellers round about, within a mile or more, and inform them of the Houſe where the robbery is made, the number of the Thieves, how dreſſed and armed, and which way they are gone, *&c.*

The Author doubts not but this Invention may be much improved: But, as to his *Probleme* above-expreſſed, it ſeems, to us, that that muſt be ſetled by Experience (rather than Demonſtrations,) there being a complication of ſo many *phyſical* Accidents, that the neglect of ſome one Un-heeded, may ſoon defeat a demonſtration, deduced from ſome other of them.

An Obſervation and Experiment concerning a Mineral Balſom, *found in a Mine of* Italy *by Signior* Marc-Antonio Caſtagna; *inſerted in the* 7th. Giornale Veneto de Letterati *of June* 22. 1671, *and thence Engliſh'd as follows;*

IN the Territory of *Bergamo*, Signior *M. Ant. Caſtagna* upon the confines of his Juriſdiction, lighted accidently upon a not ordinary ſweet Balſamick Scent, and following the ſame ſo as to find the Spirits thereof to ſtrike his noſe more and more ſtrongly, he firſt cauſed that Rocky Hill, where he then was, to be digged in the place that appear'd to him moſt likely to be the Seat of it, and found, that the Stones thereof harbour'd that fragrancy he ſmelt, which was ſo ſtrong, and by trials found ſo friendly to the *Uterus*, that being applyed they did in a very ſhort time cure it of any evil, 'tis ſubject to. Encouraged hereby to proſecute this work, he made his Workmen digg into the very bowels of the Hill, and after much labour and charge diſcover'd holes in ſome ſtones, as if excavated by art, of a greeniſh colour, in which he found, as diſtilled by nature and kept in veſſels, that liquor and balſom, which proved the ſource of that ſcent, which was limpid and of a white colour, like the white of an egg, but ſomewhat oleaginous, floating upon all ſorts of liquors like oyl. Beſides, he met in the ſame Cavities ſome ſmall grains concreted of the ſaid liquor, reſembling that which they call white Amber; which, being Chymically diſtilled, had the ſame odour with the Balſom. This raiſeth the curioſity of many, to know what rich Ore may be lodged amongſt or under thoſe ſtones.

Two Obſervations made by P. Franceſco Lana, *the Author of the* Prodromus *premiſed to* Arte Maeſtra *, *concerning ſome of the effects of the* Burning Concave *of* Lions; *and alſo an odd Salt extracted out of a Metallic ſubſtance: Taken out of the ſame* Venetian *Journal*.

* *Spoken of in* Numb. 69.

THe *firſt* is, That the ſaid *Fr. Lana* having been inform'd, that that famous *Burning Concave*, not long ſince made by M. *de Vilette*, did much ſooner melt Iron, than Gold or Silver; he eſteems it worth conſidering, why a Kitchin-fire doth the contrary, melting Gold ſooner than Iron? Whether it proceeds thence, that the Aſtral heat of the Sun is dryer than our common fire, having much humidity in it; whence Gold being moiſter than Iron, may more reſiſt the dry celeſtial heat of the Sun, than Iron and the reſt of the dryer Mettals can do? Or, Whether Gold, being of all Mettals we know of, the longeſt a producing and perfecting by the Solar heat, ſo 'tis alſo longeſt a diſſolving by the ſame? &c.

The *other* is, that the ſaid P. *Lana*, having extracted out of a Metallic Subſtance a very white Salt, the ſame was, upon the application of the gentleſt heat, reſolved into a Golden-colour'd liquor; which being removed from that warmth, as ſoon as it felt the cool Air, and even by opening the Glaſs wherein it was incloſed, did in a moment ſhoot afreſh into the ſame Salt; and that (which ſeem'd oddeſt) whilſt he was pouring it out of one glaſs into another during its fluidity, it was diſperſed all over the glaſs it was poured into, ſuddenly congealing into moſt fine threds, many of which were extended from one ſide of the glaſs to the other, and, hanging as 'twere in the Air, formed juſt like the ſubtileſt Cob-webs, not at all rigid, but, by reaſon of their exquiſite ſubtlety, pliable, and ſcarce perceivable by the Eye.

De *Lunæ* ad *Pleiadas* reliquas Applicationibus, Anno 1672 obſervandis, promiſſa appendicula *Johannis Flamſteed.*

T*Andem, Clariſſime* Oldenburgi, *promiſſi memor, tempora reliquarum applicationum* Lunæ *ad* Pleiades, *Anno* 1672 *viſibilium, craſſius editis Schedis exhibita, præcisè hic indigitata ad Te mitto: Stellis loca aſſignavi infra ſcripta ex nuperis, &, ni fallor, accuratis obſervationibus; media prius lucida, eodem omnino loco, & latitudine donatâ, quæ Authori* Carolino *(cujus in ſupputando utor numeris) utique arrideat; cæteris etiam abinde diſpoſitis; quas tamen omnes, propriam ſi hac in re ſententiam ſequi licuiſſet, tres vel ſaltem duos ſcrupulos primos promotiores, nec non & latiores ab Ecliptica proponerem: Ineunte Anno* 1672 *conſtitutæ;*

Pleiadum.		*Long.* ♉ °	'	"	*Lat. Bor.* °	'	"	
Occidentalis lucidior ———	b	24–45	15		4	8	51	5
Intra hanc & Borealiorem Teleſcopicam	g	24–46	47		4	19	21	8
Occidentalis Borealior ———	c	24–54	48		4	28	19	
Supremi in Quadri latero ———	e	25–01	24		4	20	39	
Infima Auſtralis oppoſita ———	d	25–02	18		3	53	59	
Media & lucida ———	a	25–19	48		4	00	00	
Quæ in cuſpide ad ortum ———	f	25–41	29		3	52	19	
Orientalium ſuperior teleſcopica ———	h	25–42	55		3	56	51	

Inde cum Feb. 23 *paulo ante mediam noctem appulſum ad haſce Luna faciet, Mediam Auſtrino limbo præcisè tacturam comperio; cum prius Occidentalem lucidiorem Borealiorem & ſupremam in Quadrilatero occultaverit.*

Etenim Londini,

Hor.	'	"				*Lat.* ✱^{a} *à Cent.* ☽^{a}		
11	01	00	*Occidentalis lucidior*	b	*tegitur*	12	30	*Auſtr.*
11	10	37	*Occidentalis borealior*	c	*abſconditur*	7	30	*Bor.*
11	18	04	*Suprema in Quadrilat.*	e	*occultatur*	0	16	*Bor.*
11	41	48	*Occidentalis lucidior*	b	*prodit*	9	40	*Auſtr.*
11	57	17	*Occidentalis borealior*	c	*emergit*	10	11	*Bor.*
12	12	10	*Suprema in Quadrilat.*	e	*evadit*	3	20	*Bor.*

Præterea via Lunæ viſibilis, & ſi verſus Orientales inclinatur, vix tamen eas, ob minores latitudines, limbo Auſtrali tanget, credo.

Iterum Auguſti 6, *manè Luna rurſus Stellas* e & c *conteget nobis, ſic ut horis à media nocte præcedente fiant.*

h.	'	"				*h.*	
1	31	26	*Occidentalis borealioris*	c	*obtectio:*	3—42	*Bor.*
1	41	29	*Suprema in Quadrilatero*	e	*occultatio:*	5—16	*Auſtr.*
2	39	23	*Occidentalis borealioris*	c	*emerſio:*	2—37	*Auſtr.*
2	45	16	*Suprema in Quadrilatero*	e	*evaſio:*	10—50	*Auſtr.*

Denuo Octobris 26, *paulo ante mediam noctem eaſdem duas noſtro conſpectui ſurripiet; ut*

h.	′	″			′	″	
11	33	24	c	*Occidentalis borealior abſcondatur :*	0	14	*Bor.*
11	51	52	e	*Suprema in Quadrilatero occultetur :*	8	24	*Auſtr.*
12	41	29	c	*Occidentalis borealior eluctetur :*	3	18	*Auſtr.*
12	46	37	e	*Suprema in Quadrilatero exſplendeat :*	11	14	*Auſtr.*

Poſtremo Decembris 20, *borealiorem occidentalem* c *ſubteget Luna, cujus conſpicietur p. m.*

	h.	′	″			′	″	
Occultatio ——	9	02	36	*Lat.* $*^{a}$ *à Cent.* ☽ *in*	*Ingr.*	11	25	*Auſtr.*
Retectio ——	9	50	44		*Emer.*	11	31	
Mora ſub Luna		48	08					

Interea ſuprema in Quadrilatero e *clarè extabit à Luna, quâ-cum ſecundum longitudinem conjungetur ſtellæ hora* 9^{h}. 40′. 17″, *quo tempore à centro Lunæ apparens latitudo* 19′. 10″, *Lunæ viſibilis ſemidiameter* 16′. 27″ : *Stabit propterea ſtella à limbo Auſtrino Lunæ* 2′. 43″. *ad Auſtrum. Quod an ita cœlitus fiet, an ſecus, inter cætera ſequentis anni Phænomena, cœlorum Studioſis obſervandum proponimus. Editæ porrò Synopſi, ii Lunæ motus adnectantur, quos ad tempora apparentiarum indaganda è dictis tabulis computavi, qui ſunt;*

	Anom. med.	☽ *à* ☉*e æqu.*	*Arg. Lat.*	*Paral.*	*Semid.*	*Horoſ.*	☽ *Alt.*	*A.par.*
h. ′ ″	S. ° ′ ″	S. ° ′	S. ° ′ ″	′ ″	′ ″	S.		
Feb. 23.12.12.40	5 21.55. 6	2. 9.54.59	2.11.54.46	63.42	17.13	♏ 25	4.27	42.30
Ag. 5.13.44.49	5.05.34.20	9. 2.03.20	2.17.35.57	63.10	17.14	♋ 21	38. 1	62.37
Octob. 26.13. 3.39	4.25.48.51	6.10.37. 4	2.23.56.43	59.24	16.18	♍ 7½	02. 0	67.53
Dec. 20.10.16.51	1.23.28.51	4.17.50.23	2.24.26.32	60.04	16.27	♍ 19	57.20	54.30

Sic cum opportunitates, tum commoda obſervationum præmonſtravi, quibus ſi ſedulo fidi Cœliſpices invigilaverint, nec ſuas nobiſcum obſervationes communicare gravati fuerint, hos labores ſat benè compenſatos arbitrabimur.

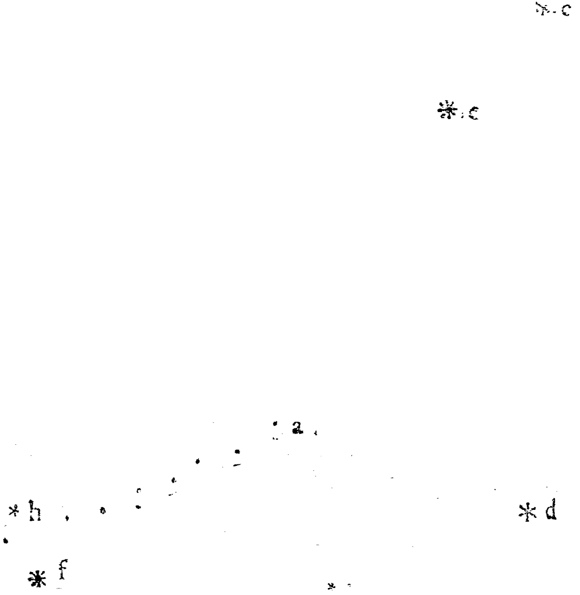
Veruntamen, ſi etiamnum quæras, è quibus obſervationibus Pleiadum loca ita reſtituerim, nec id Te celari velim. Tubum habeo pedum 13⅔, *lentibus convexis, & micrometore exactiſſimo* Townleiano (*mihi a viro cordato, & horum ſtudiorum amantiſſimo*, Jona More, *donato*) *inſtructum; quo cum noctibus ſerenioribus menſium* Octobris & Novembris, *nuper elapſorum, minutas frequenter harum ſtellularum intercapedines dimenſus ſum, idque adeò auſpicato, ut nunquam* 20″, *imò perraro* 10″. *inter ſe diſſiderent repetitæ obſervationes; à prægreſſis etiam defuncti D. Gaſcognii, & nuperis Generoſiſſimi* Townleii (*quantorum hominum!*) *eadem ratione peractis obſervationibus, confirmatæ; quæ quidem diſtantiæ limatiſſimæ, & in locis Latitudinibuſque* Pleiadum *inveſtigandis uſitatæ; ſunt,*

a b

				Muto quæ
a	b	35'	40''.	
a	e	27	40	31'
e	b	20	00	32
c	b	21	45	22
e	c	10	00	11
e	g	14	40	
c	g	11	55	
b	d	22	04	24
a	d	18	30	22
e	d	26	10	30
d	i	16	25	
a	i	18	18	
f	i	29	04	
f	a	23	00	27
h	a	23	20	
f	h	4	45	4

Addit Vinc. Mutus *in Epiſtola ad Doctiſſimum* Ricciolum, *cujus meminit in Appendice ad* Almageſti Novi *Tomum primum pag.* 747 : Occidentalem lucidiorem tranſiiſſe meridianum in eadem omnino altitudine ac Lucidam Pleiadum : *Quâ fretus adverſione haud difficile mihi fuit, invento prius angulo paralleli declinationis, cum parallelo latitudinis, triangulorum reſolutione, cæteras omnes ſtellulas locis debitis & datis donare.*

Monendum tantummodò, me ſtellam Teleſcopicam i, (*nonæ circiter lucis, quæ ſecunda eſt quarundam in linea detorta à Media & Lucida perpendentium, & reperitur in* ♉ 25°. 14'. 4''. *cum latitudine* 3°. 42'. 37'';) *propterea meis obſervationibus adſciviſſe, ut ejus adjutorio ſtellas*, f & h, *locis debitis accuratius diſponerem ; quod abſque ea affectum dare admodum difficile fuiſſet, quam propterea, cùm ulterius uſui eſſe non poſſit, cum cæteris antea non numeravimus. Interim ſi plurimùm à* Tychonicis & Mutianis *locis*, noſtri *diſſidere videantur, nec nobis id culpæ verſum velim, nec illis, qui, noſtris deſtituti ſubſidiis, Tubo nimirum, vel exquiſito Micrometro, in hanc præciſionem ſuas provehere obſervationes neutiquam potuerunt.*



An Account of ſome Books.

I. *ELEMENS de GEOMETRIE; par le P.* Ignace Gaſton Pardies, *de la Comp. de I.* *A* Paris 1671, in 12°.

THe Learned Author of this Tract declareth, that in it he hath given a ſhort and eaſy Method to learn what is neceſſary to be known of *Euclid*, *Archimedes*, *Apollonius*, and of the beſt Inventions of the Ancient and Modern Geometricians. Of which Method he hath now publiſh't the firſt 9 Books; reſerving to another time the remaining *Seven*, which, *he ſaith*, are to explain the more profound and ſublime inventions of this Science, but are not ſo neceſſary to thoſe, that have a mind to *begin* the Study of it; for whoſe greater conveniency he ſeems to have taken the pains to divulge this firſt part, In which he treateth of what he thought moſt conſiderable in the 15 Books of *Euclid*; and beſides, What *Archimedes* hath demonſtrated of the Quadrature of the Circle, as alſo the Doctrine of Logarithms, of *Sinus*'s, *&c.* He ſhews the admirable proprieties of the Numbers, which *Euclid* hath demonſtrated in the 7, 8, and *9th.* of his *Elements.* He affirms, to have found a new way of Teaching the Doctrine of *Incommenſurables*, and given Directions in four or five ſmall pages, perfectly to comprehend what very few perſons, even of thoſe that meddle with Geometry, are able to underſtand.

Beſides this, he treateth of divers kinds of *Progreſſions*, chiefly inſiſting on the Two moſt famous ones, *viz.* the *Geometrical* and *Arithmetical*; and comparing them one with another, he treateth of *Logarithms*, and ſhews the Art of them by the means of a Geometrick Line, by him eſteem'd very uſeful for the Reſolution of all ſorts of Algebraical Problems; by the help of which he ſaith to have formerly ſquared the *Hyperbola*.

He concludeth this *firſt* Part with a ſhort *Practical* Geometry; wherein, beſides the more eaſy and more common

Operations, he ſaith he hath delivered the Principles not only *of* meaſuring the Magnitudes and Diſtances of places Inacceſſible; *of* making the Map of a place or a province; *of* finding the *Sinus*'s, *Tangents* and *Secants* of all Angles; but in ſhort, *of* coming to the Knowledge of what ever appertains to this part of Geometry.

In his *Preface* he promiſeth to give us, *next*, his Algebra, his Doctrine of Conical Sections, Sphericks and Staticks; but, above all, to eſtabliſh Five or ſix General Rules, whence afterwards, by way of Corollaries, may be drawn the demonſtration of an Infinity of Propoſitions, which paſs for great ones in Geometry: Where, *he adds*, ſhall be found the nature and meaſure of *Aſymptotick* ſpaces, as the moſt admirable knowledge in the World; thoſe ſpaces being of an extent actually infinite, compriſed between two lines, which being infinitely prolonged do never meet; but of which yet it may be demonſtrated, that they are equal to a Circle or another determined figure; ſo that *Infinite* it ſelf, as immenſe and innumerable as it is, may notwithſtanding be reduced to a *calculus* and to a Geometrical meaſure, and that the Mind of Man, being greater than it, is capable to comprehend it; For ſince Imagination cannot attain ſo far as to repreſent unto us what is Infinite; the demonſtration, we make of the nature and proprieties of this immenſe and infinite Aſympotick extenſion, convinceth us at the ſame time, that we have within us a power capable to repreſent unto us this infinite Extenſion. For, *ſaith he*, as, for meaſuring with a Rule and Compaſs a Figure repreſented upon paper, I muſt have this Figure preſent to mine eyes and hands, that ſo, by applying the Inſtruments to its angles and ſides, I may take all the dimenſions of it, and ſo determine its Magnitude; even ſo, for taking with the rule of my Reaſon the meaſures of this Aſymptotick ſpace, I muſt have an *Idea* thereof inwardly preſented to my Mind, and this Mind by applying it ſelf, as it were, to this *Idea* and Interior figure, muſt take the dimenſions of it, determine its bigneſs, and demonſtrate all its proprieties, *&c.*

In the ſame *Preface* the Author deduceth largely, wherein his Method of Teaching *Geometry* differs from the Methods of others, as to facility and intelligibleneſs: which we forbear to tranſcribe, becauſe it would take up too much of that room, which we ſhall need for giving ſome account of Two other Authors.

II. *Regnerus de Graaf* de *SUCCO PANCREATICO.* *Lugduni Batavorum,* An. 1671, in 12°.

THat the Reader may not think, we twice ſerve up the ſame matter, foraſmuch as we may ſeem to have deſcribed this very Tract long ago, *viz.* in Numb. 10. p. 178; we muſt inform him, that *this Edition* is by the Author himſelf eſteem'd to deſerve in a manner the Name of a New Treatiſe, by reaſon of ſeveral New Obſervations added, and divers Objections ſolved therein. Beſides, that there is annexed to it the Author's Ingenious Letter to D. *Lucas Schacht*, Profeſſor of Phyſick at *Leyden*, *de Partibus Genitalibus Mulierum*; of which ſubject he therein ſummarily delivers, what he intends to compoſe hereafter a Book of.

De quo quidem Argumento ne nihil dicamus, linguâ minus communi rem totam, ab Authore hîc traditam, compendifacere ſtudebimus.

Ait itaque, Vaſa præparantia *Mulierum breviora eſſe quam Virorum:* Teſtes Muliebres *nullam cum Virilibus ſimilitudinem obtinere, cùm non ſint vaſcula ſeminaria, ſed perfectiſſima ova in ſe contineant, ad quæ vaſa præparantia excurrant:* Ova *in Teſtibus illis contenta fœcunda reddi, quatenus ſeminalis Aura, ex Utero per patentes ejus Tubas ad Teſtes pervadens, in Ovis inibi latitantibus fermentationem excitat; eòque ipſo Teſticulorum ſubſtantiam ad expellenda Ova diſponit, quæ à fimbria, Tubarum extremitate, excepta, per Tubas ad Uterum tranſcant:* Ligamenta *Uteri nil aliud eſſe quàm membranas multis vaſculis refertas quorum extremitates in pinguedine Pubis terminentur & evaneſcant:* Arterias Hypogaſtricas, *plures diſſeminare propagines ad Uterum, quàm ad Vaginam ejus; earum, quæ ad Uterum excurrunt, præcipuam*

miro ductu utrinque ad Uteri fundum pertingere, atque Arteriis præparantibus ſive ſpermaticis tam affabrè uniri, ut peritiores etiam Anatomici dubitare poſſint, utrum ab Hypogaſtricis, *an verò à* Præparantibus *Arteriis ſanguinem ſuum arterioſum Teſtes ac Tubæ hauriant:* Venas Hypogaſtricas, *etiam ad Uterum, Vaginam & reliquas partes tendentes, ſibi invicem tot támque patentibus nexibus copulari, ut inflatâ vel minimâ venulâ protinus totius Uteri, Vaginæ, Tubarum atque Teſtium venæ diſtendantur: Utero ſecundùm longitudinem per medium diviſo, diſſectorum vaſorum orificia quamplurima conſpici, atque Uteri cavitatem tantùm unicam reperiri, eámque ab interno Uteri oſculo uſque ad magnam ſuam capacitatem rugoſam eſſe, pluribuſque foraminulis præditam, ex quibus, preſſo Utero, pituitoſa & viſcida materia prodeat: Adhæc, in rugoſa Vaginæ tunica hinc inde etiam porulos conſpici, ſed longè pauciores ac minores, quàm in collo Uteri, niſi prope Vaginæ orificium, ubi, in Superiori inprimis parte, prope meatum urinarium, & in ipſo, tam magni ductus ſive lacunæ reperiantur, ut ſtylum craſſiuſculum admittant, ex quibus in ſalacioribus, non minùs quàm ex iis, qui ſunt in Uteri collo, materia ſeroſo-pituitoſa (impropriè* ſemen *vocata) cum impetu erumpit. Denique,* Clitoridi, *ut Membro virili, arterias, venas & nervos communicari, & quoad ſubſtantiam cum Pene virili aliquam ſimilitudinem habere; carere tamen Urethrâ, & duobus tantùm Muſculis inſtrui, licèt plerique quatuor numerent; ſub horum Muſculorum carnoſis expanſionibus ſpongioſum quoddam reperiri corpus, ex multis vaſculis & fibrillis conflatum, quod propriâ membranâ cingatur, & ad latera Vaginæ, propè ejus orificium, ab inferiori parte ad membranoſam uſque Clitoridis ſubſtantiam utrinque aſcendat, uti, ſi infletur, conſpiciendum ſe præbeat.*

Hactenus Induſtrius juxtà ac Doctus hic Author; *Cujus ampliorem de hac materia Diſſertationem, fidis Obſervationibus & Experimentis nixam, impensè deſideramus; inprimis verò, ut liquidius, quàm hactenus factum, oſtendatur, quo ſcil. meatu Ova iſta quarumvis fæmellarum è Teſtibus in Tubas, & per Tubas, quæ aliquâ ſui parte imperviæ habentur, in Uterum devolvantur. Spes interim haud levis me fovet, Controverſiam hanc de mulierum Ovariis, cùm ea hoc ipſo tempore Peritiſſimorum quorumque in*

Anglia, Gallia, Belgio, &c. *Anatomicorum tribunali ſe ſtiterit, brevi ab ipſis, in rei Anatomicæ incrementum, penitùs elucidatum iri.* *Vid.* Numb. 70. p. 2136.

III. *Phyſico-Matheſis de* LUMINE, COLORIBUS *&* IRIDE, *&c.* *Auth.* Franc. Maria Grimaldo *S.J.* Bononiæ, 1665. *in* 4°.

THis Learned Treatiſe was not to be altogether omitted in theſe *Philoſophical Occurrences*, though an Account of it hath been deferr'd (too long,) it being but lately fallen into the *Publiſher*'s hands.

The Author then finding, that much obſcurity was left in the Doctrine of *Light*, and eſteeming it rather commendable than preſumptuous, to endeavor the clearing of it, eſpecially if that be done by Experiments (which he judgeth an exceedingly conducive way for the Improvement of all Natural Knowledge;) undertaketh in Two parts to deliver his Tryals and Meditations on this Subject.

In the *Firſt* are contained the ſeveral Experiments, which may favour the Doctrine of the *Subſtantiality* of Light, together with the Ratiocinations thence ariſing.

In the *Second* is repreſented, What may be anſwered to all thoſe Arguments, ſo as to ſave the *Peripatetick* Opinion of the *Accidentality* of Light: Which yet is done in ſuch a manner, as that the Author leaveth a liberty to the Judicious Reader, to embrace which of theſe two Opinions he ſhall think the more probable.

But, more particularly, in the *former* part he explains, How many ways *Light* is propagated or diffuſed, *viz.* not only *directly*, and by *refraction*, and *reflexion*, but alſo by *diffraction*; which laſt, according to him, is done, when the parts of Light, ſeparated by a manifold diſſection, do in *the ſame medium* proceed in different ways. *Next*, he conſiders the Nature of Light, as alſo Diaphaneity, and Opacity; and taketh notice, that moſt Bodies, whether Solid or Fluid, are *porous*; on which occaſion he ventures to explain almoſt the whole Philoſophy of *Magneticks*. Then he diſcuſſeth the Queſtion, Whether the diffuſion of Light be *Inſtantaneous*, and concludeth it in the *Negative*, though the Duration of it be imperceptible. This done, he examines the nature of Reflexion and Refraction, and ſeems to acknowledge, that, ſuppoſing Light to be a *Subſtance* very fluid and very ſubtile, an account may eaſily be given, why it is reflected and refracted, and why it obſerves ſuch Laws in its reflexion and refraction, as really it doth.

Further, he diſcourſeth of *Colours*, and conſiders, How Light is changed into Colour, ſometimes by Reflexion alone, ſometimes by Refraction alone, ſometimes without either and without the change of the Medium, *vid.* by *Diffraction*. He explains alſo, How Light by the ſole intrinſick modification of it ſelf, paſſeth ſometimes into a colour that is commonly called *Apparent*: Where he declareth, that the reaſon, why Light paſſeth into an Apparent colour, is not ſome determinate Angle, at which the rays amongſt themſelves are inclined; but that that Colour is produced by the intenſion and denſity of Light. He teaches alſo, That to the Viſion of things permanently colour'd, there are not required any *intentional ſpecies*, tranſmitted from them, and contradiſtinct to Light; but that the Light, which is diffuſed, or at leaſt reflected from things colour'd, is ſufficient; yet with ſuch a Modification, as is to be found in Light *apparently* coloured: On which occaſion many particulars are delivered concerning *Reflex* Viſion, together with an Explication of that *Quære*, How the Place of the thing ſeen is perceived? *&c.* To all which is added, that the Modification of Light, by which it is both *permanently*, and (as they ſpeak) *apparently* coloured, or made ſenſible under the repreſentation of Colour, may not improbably be ſaid to be a determinate and moſt finely furrow'd Undulation of the ſame, and a kind of tremulous diffuſion, with a certain very ſubtle floating, whereby it doth, in a peculiar way of application, affect the Organ of Viſion: Which is illuſtrated and confirmed by what is by Philoſophers taught of *Sound* and *Hearing*. Upon which 'tis inferr'd, that Colours are not any thing permanent in viſible things, not of themſelves lucid, when they are not illuminated; but that they are the Light it ſelf, under ſome peculiar Modification made ſenſible by the Sight.

Laſtly, This firſt part is ended with a large Diſcourſe of the *Rainbow*, its Colours and their Order, its Circular figure, the Concentrickneſs of Rainbows, *&c.* Concluding upon the whole, that a Rainbow, both the Primary and Secundary, is generated from the Solar rays, reflected and refracted by the drops of a rorid cloud, ſo that the *Primary* is repreſented by the rays that are once reflected within thoſe drops; but the *Secundary*, by the rays twice reflected, and which after a double refraction in both caſes paſs to the Eye, placed in the *axis* of the Rainbow.

The *Second* Part is diſpatched in *Six* Propoſitions; in which the Author taketh pains, notwithſtanding all what he hath delivered before, to abet *Ariſtotle*'s opinion, importing, that Light is an *Accident*; though he diſſembleth not, that that Philoſopher ſeems to have ſomewhere favour'd the contrary Opinion; as he alſo acknowledgeth, that the Experiments and the Reaſons thence deduced for the *Subſtantiality* of Light, approach very near to a Phyſico-Mathematical evidence, eſpecially with ſuch men as have, either skilfully and carefully made thoſe Experiments, themſelves, or attentively beheld them, when made by others. However, he maketh a ſhift to ſay ſomething by way of Anſwer to all the Arguments, produced in the *firſt* place for the proof of Lights being a Subſtance: yet denying, that, though Light were an Accident, it would follow, that Colours, call'd *Permanent*, are ſomething diſtinct from Light, and reſiding in Bodies when *Light* is abſent.

IV. Marci

IV. Marci Meibomii *de Fabrica* TRIREMIUM *Liber.* Amſtelodami 1671. *in* 4°.

THis Diſcourſe treats *firſt* of the Occaſion and Original of Shipping, and relates, that it began with Oars, and then was improved by Sails, and at laſt was practiſed with the uſe of both.

In the beginning, for Celerity and Fight, they multiplied Oares, and, for ſome ſtrength, they fortifyed their ſhips with ſtrong Beaks, as Birds of pray have ſtrong Wings and a ſharp Beak.

He aſcribes to the *Sidonians* the firſt invention of Building long Ships for War, and the contrivance of filling them with Oares in ſuch a manner, that no void ſpaces might be left. As broader and ſhorter Ships were built for burthen

Gallies he diſtinguiſhes into *Monocrota*, wherein one or more rows of men do ſit in the ſame level or plain; and *Polycrota*, in which the Rowers ſit in divers heights, one above another, as in *Amphi-theaters*; whence the *Biremis*, *Triremis*, *Quadriremis*, and ſo on to the *Teſſaraconteris*, the biggeſt that we read of, and recorded to have been made by *Philopater*.

In the *Monocrota* he conſiders the manner of the Sitting of the Rowers; and the *Interſcalmium*, or the ſpace between the two Oares of the ſame *Verſus* or Row; referring the *Tranſtra* to the *Polycrota Galleys*; where he hath occaſion to examine the meaſure of the great and Roman foot and cubit; as alſo to give the meaning of the words *Verſus* (Gr. ϛοῖχος or ϛίχος) and *Ordo* (Gr. τάξις.)

Next he endeavors to explain in the Galleys that are *Polycrota* of 3, 4, 5, or more tires of Rowers, ſeated in different heights, how thoſe men could be placed. And here he pretends to have been the firſt, that hath perfected the way of leſſening the height of the ancient Galleys, by deviſing theſe two Expedients; by the firſt of which (ſaid to have been publiſhed by him 22 years ſince) he affirms to have ſhewed, ſo to place the Lateral Rowers, as that he that ſits behind an other, may move his hands and Oar *under* the ſeat of the rower ſitting next before him: By which means three lateral Rowers, which, according to *Scaliger*'s way, would require the height of 13½ feet, will be content with the ſpace of 7½ feet. By the *other* Invention, which he *now* adds, he pretends to have found a new place in thoſe Ships for almoſt *half* the number of Rowers; foraſmuch as on the ſide of the aforeſaid Rowers, he placeth others in the middle of the Ship, in *tranſtris* or traverſe Seats, which, as he imagines, (how conſonantly to uſe and practice, the Intelligent ſoon will judge) may thruſt out their Oars under the Seats of the Lateral Rowers. By which contrivance he thinks is gain'd in a *Quinqueremis* the ſpace of nine feet in height: which, he ſaith, *Scaliger*, if alive, would admire. And to all this he ſubjoyns ſome paſſages out of ancient Authors, which he conceives do much ſtrengthen the fitneſs of theſe Inventions of his, concerning both the placing of the Lateral Rowers, and thoſe that ſit in *tranſtris*. Here he inſerts the Explication of thoſe names of *Thalamita*, *Zygita*, and *Thranita*, in the *Triremis*; the firſt ſignifying him that ſits in the loweſt row; the ſecond, him that ſits in *Tranſtris*; the third, him that ſits uppermoſt.

After this, he inquireth, Whether ever ſuch great Veſſels of ſo many tires of Oars, ſitting in ſo many different heights, were ever actually built? And, if they were, Whether they ever came abroad to Fight? Eſpecially ſuch an one as that of *Philopators* is recorded to have been, of forty tires, requiring above four thouſand Rowers; and that of *Ptolemæus Philadelphus*, of thirty tires, having more than three thouſand Rowers; and another of twenty rows, requiring two thouſand. Hereupon our Author ſcruples not to affirm all to be true, what is written of ſuch vaſt Ships; adding, that he hath made it intelligible, how it may be ſo, by finding places for the *Zygitæ*, and a conveniency of moving their Oars under the Seats of thoſe that ſate next before them. And here he ſhews at large, of what determinate bigneſs thoſe Veſſels were, according to his ſuppoſition and contrivance; beginning from a *Triremis*, and ſhewing, how many Oars and Sea-men it contained, namely two hundred, of which one hundred and eighty were Rowers, and the reſt Marriners. So that in the *Athenian* Fleet, of which *Cono* was General, conſiſting of one hundred and eighty *Triremes*, there were ſix and thirty thouſand Men. Then proceeding to a *Quinque-remis*, with four hundred and twenty Men apiece; of which there were Rowers three hundred, and Souldiers one hundred and twenty. So that three things were ſtupendious in that *Roman* Fleet at *Meſſina*, and the *Carthaginian* at *Lylibeum*; *one* is, that the former conſiſted of three hundred and thirty, and the latter of three hundred and fifty Ships, moſt *Quinqueremes*, that is, an hundred and fifty feet long; the *ſecond*, that the number of Men, they contained, was one hundred and thirty thouſand, and one hundred and fifty thouſand Men; the *third*, the *apparatus* and proviſion neceſſary: Yet all this affirmed by one of the beſt of the ancient Hiſtorians, *Polybius*; who himſelf wonders at ſuch a vaſt Equipage.

Here the Author undertaketh, out of *Polybius*, *Plutarch*, and *Livy*, to refute *Salmaſius*, affirming, that hardly any Galleys were built or equipped bigger than of *Nine Tires*, called ἐννήρης.

Hence he proceeds to the Ships of *Eleven* Rows (ἑνδεκήρης,) and of *Fifteen* Rows (πεντεκαιδεκήρης;) and to one of *Sixteen* (ἑκκαιδεκήρης.)

Having diſpatched theſe particulars (of which we leave Curious and Learned Antiquaries, and good Naval Architects to judge) he propoſeth the *Uſefulneſs* of theſe his Inventions, after that, by the means of them, both the Structure and Ordering of Ancient Shipping hath been explained; and is of opinion, that the *Modern* Galleys and Galleaſſes might, according to his Model, be more conveniently built, both for celerity, ſtrength, and leſſer expences. He thinks, that the Modern form would be better, if in the Structure the proportion of the long Ships of the Antients were obſerved. And he conceiveth alſo, that Five men ſitting at one Oar in the Modern Galeaſſes,much ſtrength is waſted to no purpoſe, becauſe they ſit too near to the ſide or ſtay (the *fulcrum*;) whereas a leſſer number of Rowers, at a greater diſtance from the ſaid Stay, would give more ſtrength for more ſwiftneſs, and require leſs charge.

To which he adds, that theſe Galleys are of great uſe both in Rivers and Un-deep Seas, and therefore convenient for the Baltick and Britannick, as well as the Mediterranean Seas. Further, that they are very ſerviceable for tranſporting great Forces.

Occaſionally (to add that by the by,) he ſhews out of *Joſephus* lib.8.c.7.what is meant by the *Almyggim* Wood in Sacred Writ, 1 *Reg*.10.11, 2 *Chron*. 11. 8, &c. אַלְגֻמִּים, namely, the Indian *Pine* or *Firr tree*, brought out of *Ophir*, excellent both for a ſhining Whiteneſs and for Levity; whence very proper for *Muſical* Inſtruments.

LONDON,

Printed for *John Martyn*, Printer to the *Royal Society*. 167½.

Numb. 80.

PHILOSOPHICAL TRANSACTIONS.

February 19. 16$\frac{71}{72}$.

The CONTENTS.

A Letter of Mr. Iſaac Newton, *Mathematick Profeſſor in the Univerſity of Cambridge; containing his New Theory about* Light *and* Colors: *Where* Light *is declared to be not Similar or Homogeneal, but conſiſting of difform rays, ſome of which are more refrangible than others: And* Colors *are affirm'd to be not Qualifications of Light, deriv'd from Refractions of natural Bodies, (as 'tis generally believed;) but Original and Connate properties, which in divers rays are divers: Where ſeveral Obſervations and Experiments are alledged to prove the ſaid Theory. An Accompt of ſome Books:* I. *A Deſcription of the EAST-INDIAN COASTS, MALABAR, COROMANDEL, CEYLON, &c. in* Dutch, *by* Phil. Baldæus. II. Antonii le Grand *INSTITVTIO PHILOSOPHIÆ*, ſecundùm principia Renati Des-Cartes; *novâ methodo adornata & explicata.* III. *An Eſſay to the Advancement of MVSICK; by* Thomas Salmon *M. A. Advertiſement about* Thæon Smyrnæus. *An* Index *for the Tracts of the Year* 1671.

A Letter of Mr. Iſaac Newton, *Profeſſor of the Mathematicks in the Univerſity of Cambridge; containing his New Theory about* Light *and* Colors: *ſent by the Author to the Publiſher from Cambridge, Febr.* 6. 16$\frac{71}{72}$; *in order to be communicated to the* R. Society.

SIR,

TO perform my late promiſe to you, I ſhall without further ceremony acquaint you, that in the beginning of the Year 1666 (at which time I applyed my ſelf to the grinding of Optick glaſſes of other figures than *Spherical*,) I procured me a Triangular glaſs-Priſme, to try therewith the celebrated *Phænomena* of

Colours. And in order thereto having darkened my chamber,and made a ſmall hole in my window-ſhuts, to let in a convenient quantity of the Suns light, I placed my Priſme at his entrance,that it might be thereby refracted to the oppoſite wall. It was at firſt a very pleaſing divertiſement, to view the vivid and intenſe colours produced thereby; but after a while applying my ſelf to conſider them more circumſpectly, I became ſurpriſed to ſee them in an *oblong* form; which, according to the received laws of Refraction, I expected ſhould have been *circular*.

They were terminated at the ſides with ſtreight lines, but at the ends, the decay of light was ſo gradual, that it was difficult to determine juſtly, what was their figure; yet they ſeemed *ſemicircular*.

Comparing the length of this coloured *Spectrum* with its breadth, I found it about five times greater; a diſproportion ſo extravagant, that it excited me to a more then ordinary curioſity of examining, from whence it might proceed. I could ſcarce think, that the various *Thickneſs* of the glaſs, or the termination with ſhadow or darkneſs, could have any Influence on light to produce ſuch an effect; yet I thought it not amiſs, firſt to examine thoſe circumſtances, and ſo tryed, what would happen by tranſmitting light through parts of the glaſs of divers thickneſſes, or through holes in the window of divers bigneſſes, or by ſetting the Priſme without ſo, that the light might paſs through it, and be refracted before it was terminated by the hole: But I found none of thoſe circumſtances material. The faſhion of the colours was in all theſe caſes the ſame.

Then I ſuſpected, whether by any *unevenneſs* in the glaſs, or other contingent irregularity, theſe colours might be thus dilated. And to try this, I took another Priſme like the former, and ſo placed it, that the light, paſſing through them both, might be refracted contrary ways, and ſo by the latter returned into that courſe,from which the former had diverted it. For, by this means I thought,the *regular* effects of the firſt Priſme would be deſtroyed by the ſecond Priſme, but the *irregular* ones more augmented, by the multiplicity of refractions. The event was, that the light, which by the firſt Priſme was diffuſed into an *oblong* form, was by the ſecond reduced into an *orbicular* one with as much regularity, as when it did not at all paſs through them. So that, what ever was the cauſe of that length,'twas not any contingent irregularity.

I then proceeded to examin more critically, what might be effected by the difference of the incidence of Rays coming from divers parts of the Sun; and to that end, meaſured the ſeveral lines and angles, belonging to the Image. Its diſtance from the hole or Priſme was 22 foot; its utmoſt length 13$\frac{1}{4}$ inches; its breadth 2$\frac{5}{8}$; the diameter of the hole $\frac{1}{4}$ of an inch; the angle, with the Rays, tending towards the middle of the image, made with thoſe lines, in which they would have proceeded without refraction, was 44 deg. 56′. And the vertical Angle of the Priſme, 63 deg. 12′. Alſo the Refractions on both ſides the Priſme, that is, of the Incident, and Emergent Rays, were as near, as I could make them, equal, and conſequently about 54 deg. 4′. And the Rays fell perpendicularly upon the wall. Now ſubducting the diameter of the hole from the length and breadth of the Image, there remains 13 Inches the length, and 2$\frac{3}{8}$ the breadth, comprehended by thoſe Rays, which paſſed through the center of the ſaid hole, and conſequently the angle of the hole, which that breadth ſubtended, was about 31′, anſwerable to the Suns Diameter; but the angle, which its length ſubtended, was more then five ſuch diameters, namely 2 deg. 49′.

Having made theſe obſervations, I firſt computed from them the refractive power of that glaſs, and found it meaſured by the *ratio* of the ſines, 20 to 31. And then, by that *ratio*, I computed the Refractions of two Rays flowing from oppoſite parts of the Sun's *diſcus*, ſo as to differ 31′ in their obliquity of Incidence, and found, that the emergent Rays ſhould have comprehended an angle of about 31′, as they did, before they were incident.

But becauſe this computation was founded on the Hypotheſis of the proportionality of the *ſines* of Incidence, and Refraction, which though by my own Experience I could not imagine to be ſo erroneous, as to make that Angle but 31′, which in reality was 2 deg. 49′; yet my curioſity cauſed me again to take my Priſme. And having placed it at my window, as before, I obſerved, that by turning it a little about its *axis* to and fro, ſo as to vary its obliquity to the light, more then an angle of 4 or 5 degrees, the Colours were not thereby ſenſibly tranſlated from their place on the wall, and conſequently by that variation of Incidence, the quantity of Refraction was not ſenſibly varied. By this Experiment therefore, as well as by the former computation, it was evident, that the difference of the Incidence of Rays, flowing from divers parts of the Sun, could not make them after decuſſation diverge at a ſenſibly greater angle, than that at which they before converged; which being, at moſt, but about 31 or 32 minutes, there ſtill remained ſome other cauſe to be found out, from whence it could be 2 degr. 49′.

Then I began to ſuſpect, whether the Rays, after their trajection through the Priſme, did not move in curve lines, and according to their more or leſs curvity tend to divers parts of the wall. And it increaſed my ſuſpition, when I remembred that I had often ſeen a Tennis-ball, ſtruck with an oblique Racket, deſcribe ſuch a curve line. For, a circular as well as a progreſſive motion being communicated to it by that ſtroak, its parts on that ſide, where the motions conſpire, muſt preſs and beat the contiguous Air more violently than on the other, and there excite a reluctancy and reaction of the Air proportionably greater. And for the ſame reaſon, if the Rays of light ſhould poſſibly be globular bodies, and by their oblique paſſage out of one medium into another acquire a circulating motion, they ought to feel the greater reſiſtance from the ambient Æther, on that ſide, where the motions conſpire, and thence be continually bowed to the other. But notwithſtanding this plauſible ground of ſuſpition, when I came to examine it, I could obſerve no ſuch curvity in them. And beſides (which was enough for my purpoſe) I obſerved, that the difference 'twixt the length of the Image, and diameter of the hole, through which the light was tranſmitted, was proportionable to their diſtance.

The gradual removal of theſe ſuſpitions, at length led me to the *Experimentum Crucis*, which was this: I took two boards, and placed one of them cloſe behind the Priſme at the window, ſo that the light might paſs through a ſmall hole, made in it for the purpoſe, and fall on the other board, which I placed at about 12 feet diſtance, having firſt made a ſmall hole in it alſo, for ſome of that Incident light to paſs through. Then I placed another Priſme behind this ſecond board, ſo that the light, trajected through both the boards, might paſs through that alſo, and be again refracted before it arrived at the wall. This done, I took the firſt Priſme in my hand, and turned it to and fro ſlowly about its *Axis*, ſo much as to make the ſeveral parts of the Image, caſt on the ſecond board, ſucceſſively paſs through the hole in it, that I might obſerve to what places on the wall the ſecond Priſme would refract them.

And I ſaw by the variation of thoſe places, that the light, tending to that end of the Image, towards which the refraction of the firſt Priſme was made, did in the ſecond Priſme ſuffer a Refraction conſiderably greater then the light tending to the other end. And ſo the true cauſe of the length of that Image was detected to be no other, then that *Light* conſiſts of *Rays differently refrangible*, which, without any reſpect to a difference in their incidence, were, according to their degrees of refrangibility, tranſmitted towards divers parts of the wall.

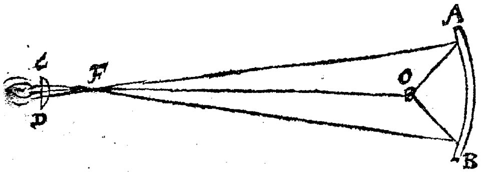
When I underſtood this, I left off my aforeſaid Glaſs works; for I ſaw, that the perfection of Teleſcopes was hitherto limited, not ſo much for want of glaſſes truly figured according to the preſcriptions of Optick Authors, (which all men have hitherto imagined,) as becauſe that Light it ſelf is a *Heterogeneous mixture of differently refrangible Rays*. So that, were a glaſs ſo exactly figured, as to collect any one ſort of rays into one point, it could not collect thoſe alſo into the ſame point, which having the ſame Incidence upon the ſame Medium are apt to ſuffer a different refraction. Nay, I wondered, that ſeeing the difference of refrangibility was ſo great, as I found it, Teleſcopes ſhould arrive to that perfection they are now at. For, meaſuring the refractions in one of my Priſmes, I found, that ſuppoſing the common *ſine* of Incidence upon one of its planes was 44 parts, the *ſine* of refraction of the utmoſt Rays on the red end of the Colours, made out of the glaſs into the Air, would be *68* parts, and the *ſine* of refraction of the utmoſt rays on the other end, *69* parts: So that the difference is about a 24*th* or 25*th* part of the whole refraction. And conſequently, the object-glaſs of any Teleſcope cannot collect all the rays, which come from one point of an object, ſo as to make them convene at its *focus* in leſs room then in a circular ſpace, whoſe diameter is the 50*th* part of the Diameter of its Aperture; which is an irregularity, ſome hundreds of times greater, then a circularly figured *Lens*, of ſo ſmall a ſection as the Object glaſſes of long Teleſcopes are, would cauſe by the unfitneſs of its figure, were Light *uniform*.

This made me take *Reflections* into conſideration, and finding them regular, ſo that the Angle of Reflection of all ſorts of Rays was equal to their Angle of Incidence; I underſtood, that by their mediation Optick inſtruments might be brought to any degree of perfection imaginable, provided a *Reflecting* ſubſtance could be found, which would poliſh as finely as Glaſs, and *reflect* as much light, as glaſs *tranſmits*, and the art of communicating to it a *Parabolick* figure be alſo attained. But there ſeemed very great difficulties, and I have almoſt thought them inſuperable, when I further conſidered, that every irregularity in a reflecting ſuperficies makes the rays ſtray 5 or 6 times more out of their due courſe, than the like irregularities in a refracting one: So that a much greater curioſity would be here requiſite, than in figuring glaſſes for Refraction.

Amidſt theſe thoughts I was forced from *Cambridge* by the Intervening Plague, and it was more then two years, before I proceeded further. But then having thought on a tender way of poliſhing, proper for metall, whereby, as I imagined, the figure alſo would be corrected to the laſt; I began to try, what might be effected in this kind, and by degrees ſo far perfected an Inſtrument (in the eſſential parts of it like that I ſent to *London*,) by which I could diſcern Jupiters 4 Concomitants, and ſhewed them divers times to two others of my acquaintance. I could alſo diſcern the Moon-like phaſe of *Venus*, but not very diſtinctly, nor without ſome niceneſs in diſpoſing the Inſtrument.

From that time I was interrupted till this laſt Autumn, when I made the other. And as that was ſenſibly better then the firſt (eſpecially for Day-Objects,) ſo I doubt not, but they will be ſtill brought to a much greater perfection by their endeavours, who, as you inform me, are taking care about it at *London*.

I have ſometimes thought to make a *Microſcope*, which in like manner ſhould have, inſtead of an Object-glaſs, a Reflecting piece of metall. And this I hope they will alſo take into conſideration. For thoſe Inſtruments ſeem as capable of improvement as *Teleſcopes*, and perhaps more, becauſe but one reflective piece of metall is requiſite in them, as you may perceive by the annexed diagram, where A B repreſenteth the object metall, C D the eye glaſs, F their common Focus, and O the other focus of the metall, in which the object is placed.



But to return from this digreſſion, I told you, that Light is not ſimilar, or homogeneal, but conſiſts of *difform* Rays, ſome of which are more refrangible than others: So that of thoſe, which are alike incident on the ſame medium, ſome ſhall be more refracted than others, and that not by any virtue of the glaſs, or other external cauſe, but from a prediſpoſition, which every particular Ray hath to ſuffer a particular degree of Refraction.

I ſhall now proceed to acquaint you with another more notable difformity in its Rays, wherein the *Origin of Colours* is unfolded: Concerning which I ſhall lay down the *Doctrine* firſt, and then, for its examination, give you an inſtance or two of the *Experiments*, as a ſpecimen of the reſt.

The Doctrine you will find comprehended and illuſtrated in the following propoſitions.

1. As the Rays of light differ in degrees of Refrangibility, ſo they alſo differ in their diſpoſition to exhibit this or that particular colour. Colours are not *Qualifications of Light*, derived from Refractions, or Reflections of natural Bodies (as 'tis generally believed,) but *Original* and *connate properties*, which in divers Rays are divers. Some Rays are diſpoſed to exhibit a red colour and no other; ſome a yellow and no other, ſome a green and no other, and ſo of the reſt. Nor are there only Rays proper and particular to the more eminent colours, but even to all their intermediate gradations.

2. To the ſame degree of Refrangibility ever belongs the ſame colour, and to the ſame colour ever belongs the ſame degree of Refrangibility. The *leaſt Refrangible* Rays are all diſpoſed to exhibit a *Red* colour, and contrarily thoſe Rays, which are diſpoſed to exhibit a *Red* colour, are all the leaſt refrangible: So the *moſt refrangible* Rays are all diſpoſed to exhibit a deep *Violet-Colour*, and contrarily thoſe which are apt to exhibit ſuch a violet colour, are all the moſt Refrangible. And ſo to all the intermediate colours in a continued ſeries belong intermediate degrees of refrangibility. And this Analogy 'twixt colours, and refrangibility, is very preciſe and ſtrict; the Rays always either exactly agreeing in both, or proportionally diſagreeing in both.

3. The ſpecies of colour, and degree of Refrangibility proper to any particular ſort of Rays, is not mutable by Refraction, nor by Reflection from natural bodies, nor by any other cauſe, that I could yet obſerve. When any one ſort of Rays hath been well

parted from thoſe of other kinds, it hath afterwards obſtinately retained its colour, notwithſtanding my utmoſt endeavours to change it. I have refracted it with Priſmes, and reflected it with Bodies, which in Day-light were of other colours; I have intercepted it with the coloured film of Air interceding two compreſſed plates of glaſs; tranſmitted it through coloured Mediums, and through Mediums irradiated with other ſorts of Rays, and diverſly terminated it; and yet could never produce any new colour out of it. It would by contracting or dilating become more brisk, or faint, and by the loſs of many Rays, in ſome caſes very obſcure and dark; but I could never ſee it changed *in ſpecie*.

Yet ſeeming tranſmutations of Colours may be made, where there is any mixture of divers ſorts of Rays. For in ſuch mixtures, the component colours appear not, but, by their mutual allaying each other, conſtitute a midling colour. And therefore, if by refraction, or any other of the aforeſaid cauſes, the difform Rays, latent in ſuch a mixture, be ſeparated, there ſhall emerge colours different from the colour of the compoſition. Which colours are not New generated, but only made Apparent by being parted; for if they be again intirely mix't and blended together, they will again compoſe that colour, which they did before ſeparation. And for the ſame reaſon, Tranſmutations made by the convening of divers colours are not real; for when the difform Rays are again ſevered, they will exhibit the very ſame colours, which they did before they entered the compoſition; as you ſee, *Blew* and *Yellow* powders, when finely mixed, appear to the naked eye *Green*, and yet the Colours of the Component corpuſcles are not thereby really tranſmuted, but only blended. For, when viewed with a good Microſcope, they ſtill appear *Blew* and *Yellow* interſperſedly.

5. There are therefore two ſorts of Colours. The one original and ſimple, the other compounded of theſe. The Original or primary colours are, *Red*, *Yellow*, *Green*, *Blew*, and a *Violet-purple*, together with Orange, Indico, and an indefinite variety of Intermediate gradations.

6. The ſame colours in *Specie* with theſe Primary ones may be alſo produced by compoſition: For, a mixture of *Yellow* and *Blew* makes *Green*; of *Red* and *Yellow* makes *Orange*; of *Orange* and *Yellowiſh green* makes *yellow*. And in general, if any two Colours be mixed, which in the ſeries of thoſe, generated by the Priſme, are

not too far diſtant one from another, they by their mutual alloy compound that colour, which in the ſaid ſeries appeareth in the mid-way between them. But thoſe, which are ſituated at too great a diſtance, do not ſo. *Orange* and *Indico* produce not the intermediate Green, nor Scarlet and Green the intermediate yellow.

7. But the moſt ſurpriſing, and wonderful compoſition was that of *Whiteneſs*. There is no one ſort of Rays which alone can exhibit this. 'Tis ever compounded, and to its compoſition are requiſite all the aforeſaid primary Colours, mixed in a due proportion. I have often with Admiration beheld, that all the Colours of the Priſme being made to converge, and thereby to be again mixed as they were in the light before it was Incident upon the Priſme, reproduced light, intirely and perfectly white, and not at all ſenſibly differing from a *direct* Light of the Sun, unleſs when the glaſſes, I uſed, were not ſufficiently clear; for then they would a little incline it to *their* colour.

8. Hence therefore it comes to paſs, that *Whiteneſs* is the uſual colour of *Light*; for, Light is a confuſed aggregate of Rays indued with all ſorts of Colors, as they are promiſcuouſly darted from the various parts of luminous bodies. And of ſuch a confuſed aggregate, as I ſaid, is generated Whiteneſs, if there be a due proportion of the Ingredients; but if any one predominate, the Light muſt incline to that colour; as it happens in the Blew flame of Brimſtone; the yellow flame of a Candle; and the various colours of the Fixed ſtars.

9. Theſe things conſidered, the *manner*, how colours are produced by the Priſme, is evident. For, of the Rays, conſtituting the incident light, ſince thoſe which differ in Colour proportionally differ in Refrangibility, *they* by their unequall refractions muſt be ſevered and diſperſed into an oblong form in an orderly ſucceſſion from the leaſt refracted Scarlet to the moſt refracted Violet. And for the ſame reaſon it is, that objects, when looked upon through a Priſme, appear coloured. For, the difform Rays, by their unequal Refractions, are made to diverge towards ſeveral parts of the *Retina*, and there expreſs the Images of things coloured, as in the former caſe they did the Suns Image upon a wall. And by this inequality of refractions they become not only coloured, but alſo very confuſed and indiſtinct

10. Why the Colours of the *Rainbow* appear in falling drops

of Rain, is alſo from hence evident. For, thoſe drops, which refract the Rays, diſpoſed to appear purple, in greateſt quantity to the Spectators eye, refract the Rays of other ſorts ſo much leſs, as to make them paſs beſide it; and ſuch are the drops on the inſide of the *Primary* Bow, and on the outſide of the *Secondary* or Exteriour one. So thoſe drops, which refract in greateſt plenty the Rays, apt to appear red, toward the Spectators eye, refract thoſe of other ſorts ſo much more, as to make them paſs beſide it; and ſuch are the drops on the exteriour part of the *Primary*, and interiour part of the *Secondary* Bow.

11. The odd Phænomena of an infuſion of *Lignum Nephriticum*, *Leaf gold*, *Fragments of coloured glaſs*, and ſome other tranſparently coloured bodies, appearing in one poſition of one colour, and of another in another, are on theſe grounds no longer riddles. For, thoſe are ſubſtances apt to reflect one ſort of light and tranſmit another; as may be ſeen in a dark room, by illuminating them with ſimilar or uncompounded light. For, then they appear of that colour only, with which they are illuminated, but yet in one poſition more vivid and luminous than in another, accordingly as they are diſpoſed more or leſs to reflect or tranſmit the incident colour.

12. From hence alſo is manifeſt the reaſon of an unexpected Experiment, which Mr. *Hook* ſomewhere in his *Micrography* relates to have made with two wedg-like tranſparent veſſels, fill'd the one with a red, the other with a blew liquor: namely, that though they were ſeverally tranſparent enough, yet both together became opake; For, if one tranſmitted only red, and the other only blew, no rays could paſs through both.

13. I might add more inſtances of this nature, but I ſhall conclude with this general one, that the Colours of all natural Bodies have no other origin than this, that they are variouſly qualified to reflect one ſort of light in greater plenty then another. And this I have experimented in a dark Room by illuminating thoſe bodies with uncompounded light of divers colours. For by that means any body may be made to appear of any colour. They have there no appropriate colour, but ever appear of the colour of the light caſt upon them, but yet with this difference, that they are moſt brisk and vivid in the light of their own day-light-colour. *Minium* appeareth there of any colour indifferently, with which 'tis illuſtrated, but yet moſt luminous in red, and ſo

Biſe appeareth indifferently of any colour with which 'tis illuſtrated, but yet moſt luminous in blew. And therefore *Minium* reflecteth Rays of any colour, but moſt copiouſly thoſe indued with red; and conſequently when illuſtrated with day-light, that is, with all ſorts of Rays promiſcuouſly blended, thoſe qualified with red ſhall abound moſt in the reflected light, and by their prevalence cauſe it to appear of that colour. And for the ſame reaſon *Biſe*, reflecting blew moſt copiouſly, ſhall appear blew by the exceſs of thoſe Rays in its reflected light; and the like of other bodies. And that this is the intire and adequate cauſe of their colours, is manifeſt, becauſe they have no power to change or alter the colours of any ſort of Rays incident apart, but put on all colours indifferently, with which they are inlightned.

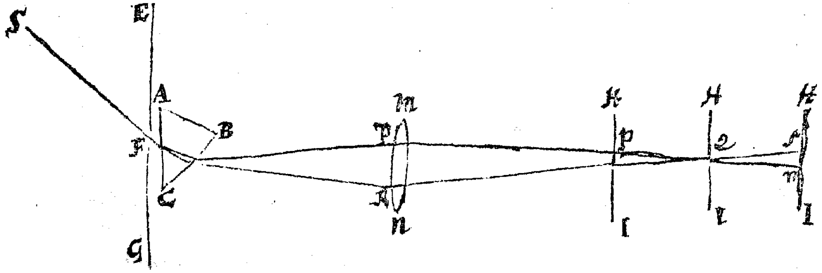
Theſe things being ſo, it can be no longer diſputed, whether there be colours in the dark, nor whether they be the qualities of the objects we ſee, no nor perhaps, whether Light be a Body. For, ſince Colours are the *qualities* of Light, having its Rays for their intire and immediate ſubject, how can we think thoſe Rays *qualities* alſo, unleſs one quality may be the ſubject of and ſuſtain another; which in effect is to call it *Subſtance*. We ſhould not know Bodies for ſubſtances, were it not for their ſenſible qualities, and the Principal of thoſe being now found due to ſomething elſe, we have as good reaſon to believe that to be a Subſtance alſo.

Beſides; whoever thought any quality to be a *heterogeneous* aggregate, ſuch as Light is diſcovered to be. But, to determine more abſolutely, what Light is, after what manner refracted, and by what modes or actions it produceth in our minds the Phantaſms of Colours, is not ſo eaſie. And I ſhall not mingle conjectures with certainties.

Reviewing what I have written, I ſee the diſcourſe it ſelf will lead to divers Experiments ſufficient for its examination: And therefore I ſhall not trouble you further, than to deſcribe one of thoſe, which I have already inſinuated.

In a darkened Room make a hole in the ſhut of a window, whoſe diameter may conveniently be about a third part of an inch, to admit a convenient quantity of the Suns light: And there place a clear and colourleſs Priſme, to refract the entring light towards the further part of the Room, which, as I ſaid, will thereby be diffuſed into an oblong coloured Image. Then place a *Lens* of about three foot radius (ſuppoſe a broad Object-glaſs of a three foot Teleſcope,) at the diſtance of about four or five foot from thence, through which all thoſe colours may at once be tranſmitted, and made by its Refraction to convene at a further diſtance of about ten or twelve feet. If at that diſtance you intercept this light with a ſheet of white paper, you will ſee the colours converted into whiteneſs again by being mingled. But it is requiſite, that the *Priſme* and *Lens* be placed ſteddy, and that the paper, on which the colours are caſt, be moved to and fro; for, by ſuch motion, you will not only find, at what diſtance the whiteneſs is moſt perfect, but alſo ſee, how the colours gradually convene, and vaniſh into whiteneſs, and afterwards having croſſed one another in that place where they compound Whiteneſs, are again diſſipated, and ſevered, and in an inverted order retain the ſame colours, which they had before they entered the compoſition. You may alſo ſee, that, if any of the Colours at the *Lens* be intercepted, the Whiteneſs will be changed into the other colours. And therefore, that the compoſition of whiteneſs be perfect, care muſt be taken, that none of the colours fall beſides the *Lens*.

In the annexed deſign of this Experiment, A B C expreſſeth the Priſm ſet endwiſe to ſight, cloſe by the hole F of the window



E G. Its vertical Angle A C B may conveniently be about 60 degrees: *M N* deſigneth the *Lens*. Its breadth $2\frac{1}{2}$ or 3 inches. S F one of the ſtreight lines, in which difform Rays may be conceived to flow ſucceſſively from the Sun. F P, and F R two of thoſe Rays unequally refracted, which the *Lens* makes to converge towards Q, and after decuſſation to diverge again. And H I the paper, at divers diſtances, on which the colours are projected: which in Q conſtitute *Whiteneſs*, but are *Red* and *Yellow* in R, r, and ſ, and *Blew* and *Purple* in P, p, and π.

If you proceed further to try the impoſſibility of changing any uncompounded colour (which I have aſſerted in the third and thirteenth Propoſitions,) 'tis requiſite that the Room be made very dark, leaſt any ſcattering light, mixing with the colour, diſturb and allay it, and render it compound, contrary to the deſign of the Experiment. 'Tis alſo requiſite, that there be a perfecter ſeparation of the Colours, than, after the manner above deſcribed, can be made by the Refraction of one ſingle Priſme, and how to make ſuch further ſeparations, will ſcarce be difficult to them, that conſider the diſcovered laws of Refractions. But if tryal ſhall be made with colours not throughly ſeparated, there muſt be allowed changes proportionable to the mixture. Thus if compound Yellow light fall upon Blew *Biſe*, the Biſe will not appear perfectly yellow, but rather green, becauſe there are in the yellow mixture many rays indued with green, and Green being leſs remote from the uſual blew colour of Biſe than yellow, is the more copiouſly reflected by it.

In like manner, if any one of the Priſmatick colours, ſuppoſe Red, be intercepted, on deſign to try the aſſerted impoſſibility of reproducing that Colour out of the others which are pretermitted; 'tis neceſſary, either that the colours be very well parted before the red be intercepted, or that together with the red the neighbouring colours, into which any red is ſecretly diſperſed, (that is, the yellow, and perhaps green too) be intercepted, or elſe, that allowance be made for the emerging of ſo much red out of the yellow green, as may poſſibly have been diffuſed, and ſcatteringly blended in thoſe colours. And if theſe things be obſerved, the new Production of Red, or any intercepted colour will be found impoſſible.

This, I conceive, is enough for an Introduction to Experiments of this kind; which if any of the *R. Society* ſhall be ſo curious as to proſecute, I ſhould be very glad to be informed with what *ſucceſs*: That, if any thing ſeem to be defective, or to thwart this relation, I may have an opportunity of giving further direction about it, or of acknowledging my errors, if I have committed any.

So far this Learned and very Ingenious Letter; which having been by that *Illuſtrious Company*, before whom it was read, with much applauſe committed to the conſideration of ſome of their Fellows, well verſed in this argument, the Reader may poſſibly in an other *Tract* be informed of ſome report given in upon this Diſcourſe.

An Accompt of ſome Books.

I. *Beſchriving der* OOST-INDISCHE KUSTEN, MALABAR COROMANDEL, CEYLON, &c. *Door* Philippus Baldæus. T'Amſterdam 1672. *in Fol.*

THe Author of this recent Hiſtory, an active Dutch Miniſter, having lived many years in the *Eaſt-Indies*, eſpecially in *Ceylon*, hath taken great pains to give an account not only of the late Civil Tranſactions of his Country-men and others in thoſe parts (of moſt of which he hath been an Ey-witneſs;) but alſo of many of the Obſervables in *Natural* and *Moral* things in the ſame Countries.

Being mindful of what belongs to our deſign in theſe Tracts, we ſhall but tranſiently touch, that in this Deſcription are contained the Negotiations, Treatiſes, and ways of Trade of the Dutch there, both with the *Indians* and *Europeans*; together with many relations of what hath of late paſſed there; between the *Dutch*, *Engliſh*, *Portugueſes*, *Mores*, &c. and of the acqueſts, which the Hollanders have there made in Lands, Towns and Strong places; all which, and many others, are here repreſented in very fair *Cuts*; ſuch as are the Maps of the *Coaſts of Malabar* and *Coromandel*, and of the Iſland of *Ceylon*; and the particular Cuts of *Amadavat*, *Zuratte*, *Bombaja*, *Goa*, *Cranganor*, *Couchin*, *Coulang*, *Tutecorin*, *Negnapatan*, *Paliacatta*, *Maſulipatan*, and the repreſentations of the principal Forts of *Ceylon*, as *Batecalo*, *Gale*, *Columbo* (the long and difficult ſiege whereof, together with its being taken by the Dutch from the *Portugueſes* is here very largely deſcribed,) *Negumbo*, *Manaar* (a ſmall Iſle belonging to *Ceylon*) as alſo that conſiderable pen-inſule, *Jaſnapatnam*, lying within the ſame *Ceylon*; and may other leſs conſiderable places.

But, to come to the *Natural* Obſervations, our Author taketh notice of the following particulars; ſcattered up and down in this Volume.

1. That in the Haven of *Suratte*, (being about 22 deg. Northern lat.) a Nord-Nord-Eaſt and a South-Weſt Moon makes the higheſt water; *p.*12.

2. That the Elephants, made to fight with one another before the *G. Mogol*, manage the combat with a far greater agility and

courage than one would imagine, and that they preſently fall on, and deſiſt according to the word given, embracing one another moſt lovingly with their truncks, as ſoon as they are commanded to end the combat; *p.*21.

3. That at *Goa*, lying in 16 deg. Northern Latitude upon an Iſle, the Climat is very unwholeſome, and ſubject to great mortality; though a place ſcituate for great Trade, which it manages with *Pegu*, *Siam*, *Japan*, *Perſia*, *Cambaja*, *Arabia*, *Malabar*, *Coromandel*, *Bengala*, *Achem*, &c. *p.*79.

4. That on the Coaſt of *Malabar* the nights are very cold, and that there falls a great dew, eſpecially in the months of *January*, *Febr.* and *March*, which is followed by intolerable heats in the day; as alſo, that the Land-briſes begin in the morning about 9 and 10 a clock, and the Sea-briſes ſoon after Sun-ſetting. The Productions of that Country are chiefly *Pepper*, (which is of three ſorts, black, whitiſh, and long,) *Aloe*, *Cardemom*, *Ginger*, ſome *Salt-peter* and *Gumme-lack*; as alſo *Bezoar-ſtones*, which are beſt at *Cananor*; likewiſe *Mirabolans*, *Tamarines*: That Pepper grows beſt in ſhadowy places; hath a weak ſtem, to be ſupported like Vines; having on each branch commonly ſix cluſters, each a foot long, in colour like unripe grapes; that they gather it, being green, in *October* and *November*, expoſing it to the Sun to dry, whereby it grows black in a few days; *p.*99. 100, 101.

5. That at *Cananor* there are ſometimes found *Bezoar-ſtones*, of the bigneſs not only of a Pigeons-Egg, (which may be had for ſix or ſeven reals,) but alſo of that of a Hens-egg, for 12 reals a piece; *p.* 100.

6. That the way, there uſed, to diſcern a true *Bezoar* from a falſe one, is, *either* by preſſing upon it a red-hot iron-bodkin, whence it will receive no harm, if genuine; *or* by weighing it, and then letting it lye in water a whole night; whereupon, if it keep its former weight 'tis a true one; if not, 'tis counterfait; *ibid.*

7. That at *Cochin*, the Capital of one of the Kingdoms of *Malabar*, the Tempeſtuous winds, there reigning in the winter-months, drive together abundance of clouds againſt the mountains, where having hung a while, they fall down at laſt with a ſudden impetuoſity in dreadful ſhowers, carrying along with them ſtore of earth and ſands into the Sea, which are by the ſame, with certain winds, driven back again, and do obſtruct the mouth of the River of that place; which yet is diſ-obſtructed again in the Sommer-ſeaſon; *p.*115.

8. That moſt of the Inhabitants of *Porca* in the Country of *Malabar* have ſwollen Legs; aſcribed to the brackiſh and Saltpetry water, they muſt drink there; *p.* 143.

9. That the *Nairos*, (the Gentry of *Malabar*, and the Military men there) are from their youth, even from the ſeventh year of their age, diſciplin'd to great agility of Body, by ſtretching their tender ſinews, and anointing them with certain oyls and unguents, whereby they are diſpoſed to wind and turn their body with extraordinary nimbleneſs any way, and to wreſtle to admiration; *p.* 144, 145.

10. That about *Tutecoryn*, in *Malabar*, is one of the three chief Pearl-fiſhings in the Eaſt-Indies, comprizing *Manaar* and *Aripou*, ſcituate between *Comorin* and *Ceilon*; the other two places for taking that rich commodity being *Ormus* in *Perſia*, and *Ainam* on the coaſt of *China*. Further, that the Pearl-bearing Oyſters are hard and tough, and not good to eat: *That* they muſt be dived for, 7, 8, 9, 10, fathoms deep; *that* all years do not equally yield Pearls, in regard that ſometimes the Pearl-banks are cover'd with ſand, and ſometimes the Oyſters are too ſmall; *that* the Pearls of *Tutecoryn* and *Manaar* are inferior in goodneſs to thoſe of *Ormus*, thoſe being neither ſo white nor bright as theſe; *p.* 151.

11. That at *Tutecoryn*, lying near *Comoryn*, there is a quite different ſeaſon from the places ſcituate cloſe to the North of that *Cape*; ſince, whereas from *April* to *September* it is Summer on the South of that *Cape*, 'tis then Winter on the North of the ſame, there blowing then ſtrong winds on the one ſide of thoſe mountains, and none on the other. The like of which is found upon ſeveral other coaſts of the *Indies*, as alſo in ſome places of *Africa*; *p.* 152.

12. That the beſt ſtained clothes are made about *Maliapour*, to which a peculiar kind of water, ſpringing there, is thought to be very conducive; *p.* 159.

13. That between *Penna* and *Caleture*, North of *Palecatta*, on the coaſt of *Coromandel*, there grows the beſt *Eſſaye*; which is a ſmall root, uſed in ſtaining Indian Clothes with fixt colours. And that, to diſcern the beſt of the kind, it muſt be broken, and obſerved, whether it be of a deep red; beſides, it is to be chaw'd, and, if found of a Nitrous taſte, 'tis eſteemed good. And to examine the ſincerity of that colour, when the cloth is already ſtained with it, they rub it hard with the Juice of Limon, and ſo let it dry

in the Sun; whereupon the red colour will appear faded, if falſe.

14. That at *Petapouli*, near *Maſulipatan*, on the ſame Coaſt, there grows another excellent *Eſſaye*, call'd *Tambrevelle*, yielding ſo high and intenſe a colour, that it muſt be mixed with the *Eſſaye* of *Arrical* or *Ortacour*, to qualifie its intenſneſs. This is only in the power of the Governour of that place.

15. That the great Trafick in Diamonds and Rubies is at *Maſulipatan*; that Diamonds are digg'd in the Countries of *Golconda* and *Decan*, behind *Bengala*, near the Town *Byſilaga*; the Prince whereof keeps a continual guard there, reſerving for himſelf all ſuch Stones as way above 25 *Mangely's* or Carats. The *Old Rock* is in the Country of *Deyam*, yielding the beſt Diamonds of all. *Borneo* likewiſe is famous for theſe Stones, and eſpecially the Town *Bangar Maſſing*.

Here the Author ſpends a whole Chapter in diſcourſing of all ſorts of *Gems*, and the variety of each kind; together with the places of their growth, and the ſeveral ways of examining their goodneſs, and the meaſure of valuing them. *See Chap.* 24. *p.* 162.

16. That the Plant, which yields the *Indigo*, beareth a flower like that of *Thiſtles*, and a Seed like that of *Fænum Græcum*: That being firſt Sown, it holds out 3 years; the *firſt* year 'tis cut one foot high from the ground, and the leaves, ſtript from the ſtalks, are expoſed to dry in the Sun for a day, and then for 4 or 5 days kept in round Tanks or Ciſterns, filled with fair water, but brackiſh, with ſtones laid on them, and ſometimes ſtirring the water. This water is let out into another Ciſtern, and there left a whole night; after which, two men, ſtanding in the Tank, muſt labour with the arms, as if they were churning of Butter, till the water thickens; the ſubſtance of the *Indigo* being fallen to the bottom: which is then taken out, and being ſearſed through a fine Cloth, is thinly ſpread and laid in the Sun to dry; which maketh the fine *Indigo*. The *ſecond* year, it grows up and is cut again, being, at leaſt, as good as the *Gyngy* or wild *Indigo*; And, if you will have the Seed of *Indigo*, the ſtalks of it muſt be left to dry this time in the field, and then cut, and the Seed gathered. The *third* year, it is commonly of little force, and is uſed by the ſole *Natives* for coloration; no Strangers caring for it: *p.* 170.

17. That the principal marks of good *Indigo* are, dryneſs, lightneſs, and ſwimming on water, yielding a high Violet-colour, and when put upon live coals, giving a Violet ſmoak, and leaving but

few aſhes. That the *Indigo*-Merchant is to beware of buying moiſt *Indigo*, becauſe he will then find, that in eight days time he looſes 3 pound in 10; that the ſame is to try it in a cleer Sun-ſhine, by breaking ſome lumps in pieces, and viewing them well, whether he can obſerve any thing in them that gliſtens; which if he does, he may be ſure, that there is ſand in it, with which it hath been ſophiſticated, to increaſe and gain by the weight. But for the greater aſſurance of the goodneſs of *Indigo*, paſs the nail of your thumb over the broken pieces, and it will be of a Violet-colour, if it be good, and the higher that colour, the better the *Indigo*; *p.* 172.

18. That the beſt *Indigo* falls about *Ayra*, *Fettapour*, *Baſſaune*, *Kindawen*, but eſpecially at *Byana*; all places in the *G. Mogols* Dominions: *Ibid.*

19. That *Thea* is by the people of *China* eſteem'd wholeſomeſt when taken faſting, and without Sugar; *that* the *Dutch* uſe it much in *India* for health and chearfulneſs; *that* 'tis very diuretical, and opening the kidneys, and cauſing free reſpiration; *that* the beſt grows in the province of *Kiangnan* in *China*, about the Town *Hoci-cheu*; *that*, when good, the Leaves yield a very pleaſing ſcent; *that* 'tis a *Virgultum*, and its leaves very like that, which is called *Rhus Coriaria*, or *Sumach*; *that* the *Thea* of *China* far excels that of *Japan*; *p.* 182.

20. The regiment of Life obſerv'd by diſcreet *Hollanders* in the *Eaſt-Indies*; *ibid.*

21. A Deſcription of the *Ganges* and *Nile*; *ib.*

22. An ample Deſcription of the Iſland of *Ceylon*; *p.* 1. of the *ſecond* part of this Volume. Its riches in ſeveral precious Stones, in *Elephants*, and principally in *Cinnamon* and *Cardamom*; *ibid.*

23. That the *Dutch*, upon their Maſtering the *Portugueſes* in *Ceylon* and *Manaar*, have reſtored the Pearl-fiſhing there, which had been a good while interrupted by the Wars between theſe Nations in thoſe parts; *p.* 150.

24. That the Coaſt of *Manaar* is rich in *Fiſh*; among which there are ſtore of *Caymans*, and a kind of *Sea-Calf*, which is Amphibious, and yields Meat, not only far excelling that of *Sturgeon*, but alſo taſting like *Veal*; and that the Females of them have Milk in their Duggs; *p.* 152.

25. That, when in the Pen-inſule of *Jafnapatnam* (a part of *Ceylon*,) and in the Iſle of *Manaar* 'tis Winter and Rainy, 'tis at the

ſame time Summer in the reſt of *Ceylon*, and on the contrary; *that* in the Plains of *Ceylon* there never blow but two ſorts of *Wind*, North and South; but *that* about the higher parts of *Columbo* and *Gale*, &c. the Land-winds reign in the night, and the Sea-winds in the day-time; *p.* 153.

26. That in *Patiarapalli*, one of the Provinces of *Jaſnapatnam*, the *Elephants* by the ſtrength of their Body bear down every year abundance of wild Palm-trees, when their fruit is ripe; *p.* 170.

27. That in *Paletiva*, one of the ſmall Iſles near *Jaſnapatnam*, the people catch the wild Horſes there by chaſing them into a Water-pool, and ſo maſtering them with nooſes: *p.* 172.

28. That the Wild *Elephants* are by the tame Females of the ſame kind as 'twere duckoy'd into a lodge with trap-doors, where by hunger, and long wakes, and the diſcipline exerciſed upon them by tame *Elephants*, they are at length tamed themſelves.

29. That *Ceylon* abounds, beſides *Elephants* and *Wild Horſes*, with *Buffalo's*, *Oxen*, *Cows*, *Sheep*, *Hoggs*, *Goats*, *Dear*, *Elks*, *Wild Bores*, *Tygers*, *Bears*, *Jackals*, *Apes*, *Peacocks*, *Nightingales*, *Larks*, *Snipes*, *Partridges*, *Pigeons*, *Geeſe*, *Crows*, *Kites*, *Owls*, &c. Of the *Jackals* this Author ſaith, that they are ſo greedy after Mans fleſh, that the Inhabitants are fain to keep their Dead from them by covering their Sepulchres with large ſtones. To which he adds, that their Fleſh is very medicinal for a Conſumption; *p.* 198, 199.

30. That there are *Serpents* in *Ceylon*, which they call *Sea-Serpents*, 8, 9, or 10 Ells long; (I ſuppoſe he ſpeaks of *Dutch* meaſure:) And others, that catch *Mice* and *Rats*, and do no hurt to Mankind: As alſo another ſort, called *Cobres Capellos*, the moſt venomous of all, whoſe bite is ſaid to be commonly cured by the Stone found in the head of the ſame Creature, laid upon the wound and purged in Milk.

31. That *Ceylon* affords divers ſorts of *Precious Stones*, as *Rubies*, *Saphirs*, *Topaſſes*, *Granats*; and Mines alſo of *Gold*, *Silver*, and *Iron*, but that the Kings of the Iſland will not ſuffer the Royal Mettals to be digged up.

32. That the Commodities for Trade in *Ceylon*, are, *Stained Stuffs*, *silks*, *Porcelain*, *Spices*, *Camphire*, *Amber-gris*, *Radix Chinæ*, *Amphion*, *Muſcus*, *Santal*, *Saltpeter*, *Sulphur*, *Lead*, *Copper*, *Tin*, &c.

So much for the Philoſophical part of this Work: What concerns the particulars, relating to the proceedings of the *Dutch* in the *Eaſt-Indies*, as to their Trade there, and the Acquiſitions they have there made among the Natives, *Portugueſes*, &c; as alſo what belongs to the Morals and the odd Religions of thoſe Indian Heathens, I muſt refer the Reader to the Book it ſelf.

II. Antonii le Grand *INSTITUTIO PHILOSOPHIÆ, ſecundum Principia* Renati Des-Cartes; *nova methodo adornata & explicata.* Londini, *apud* J. Martyn, *in Cæmeterio D.* Pauli, 1672. *in* 8°.

THis Author hath with much induſtry and clearneſs laid together, in this ſmall pocket-volume, all the parts of the *Carteſian* Philoſophy, to facilitate the ſtudy of the ſame to ſuch as deſire to inſtruct themſelves in it.

He begins with the Art of uſing Reaſon aright, and inſiſts much upon this, that we are to deveſt our ſelves of the prejudices of our infancy, and to acknowledge nothing for Truth, but what we do clearly and diſtinctly underſtand; and then, that we ought to give or deny our aſſent to nothing but what exactly anſwers to ſuch a clear perception and underſtanding of ours.

And becauſe all our knowledge is uncertain, as long as we are not ſure of a *Being abſolutely perfect*, from whom, as the Firſt Truth, all verities do depend; he aſſerts the actual Exiſtence of ſuch a Being from the principles of *Des-Cartes*.

Then ſince from this ground, that there is a God, by whoſe power all things are produced, and that cannot deceive us, we are certain that we cannot err in the things which we clearly and diſtinctly know, he infers, that, ſeeing we have clear and diſtinct *Idea's* of *Corporeal* things, of which we are not the Cauſes, and which even occur often to us againſt our will, that, I ſay, thoſe idea's proceed from things without us, that do truly and actually exiſt in the world; for elſe, *ſaith he*, if God ſhould immediatly impreſs ſuch conceptions upon our Minds, or cauſe them to proceed from an object, in which there were to be found nothing of *Extenſion*, *Motion*, *Figure*, &c. God could by no means be freed from deception. Whence it follows, according to our Author, that there is a *Subſtance extended in length, breadth, and depth*, call'd *Body*, the Object of *Phyſicks*.

Now, in theſe *Phyſicks* he excludeth all *Subſtantial Forms* from Body, and aſcribeth all the Corporeal Effects of Nature to the various Size, Figure, Scituation, Motion and Reſt of Bodies. And admitting, that a Material Subſtance conſiſts in the ſaid three Dimenſions, and is not really diſtinguiſh't from *Quantity*, he thinks, that 'tis eaſie to demonſtrate, there can be no *Vacuum* in Nature; that Rarefaction is not made but by an acquiſition of new matter, &c. Here he treateth of *Gravity*, which he maketh to conſiſt in this, that all the *Subtile Matter*, that is between Us and the Moon, being moſt ſwiftly mov'd towards the Earth, driveth down ſuch Bodies as are leſs ſwiftly mov'd. He diſcourſeth alſo at large of the Nature, Principle, and Laws of *Motion*; of *Time*, and *Place*; of *Hardneſs* and *Fluidity*; of *Denſity* and *Rarity*; of *Aſperity* and *Smoothneſs*, &c.

Moreover, he treateth of the Syſteme of the Univerſe, endeavouring to demonſtrate the Creation of the World by Natural Reaſon, and the Identity of the matter of Celeſtial and Terreſtrial Bodies. Thence he proceeds to explicate the nature and motion of the Heavens, Planets, and other Celeſtial Bodies; as alſo the nature of Light, and Comets, &c. Which done, he treateth of the Earth, and aſſerts its Motion with ſome new arguments, as he thinks. Then he conſiders the productions within and under the Earth; the nature and effects of the Load ſtone; the Flux and Reflux of the Sea; the nature of the Air and of the things generated therein; the nature of Fire; of Heat and Cold; of Thunder and Lightning, &c.

After this he undertaketh the Explication of *Man*: And therein, *First* of the *Body* of Man, its parts and compoſition; where he maintains, that all the parts of the *fœtus* are at firſt formed altogether in *utero*; and explains, How Nutrition is made; and how the Motion of the Heart, Arteries and Muſcles, and the Circulation of the Bloud is performed. Then he goes on to the doctrine of *Senſation*, and, among many other particulars, endeavours to ſhew that the Human Soul receives nothing, but foraſmuch as ſhe hath her Seat in the Brain. Which done, he diſcourſeth of Viſion, and Colours, and of the reſt of the Senſes. *Secondly*, of the *Soul* of Man, whoſe Immateriality and Immortality he is aſſerting; whereas the Soul of *Brutes*, in his opinion, is meerly *Mechanical*, and depends from nothing elſe but the diſpoſition of the Organs and the Influx of Spirits. To this part he Joins the doctrine of the *Paſſions* peculiar to Man, and aſcribable to him no otherwiſe than as he is a compound of Soul and Body.

He concludeth with his *Ethicks*, and ſhews, wherein conſiſts Man's ſupream Happineſs, the nature of Vertue, and Free Will.

III. *An Eſſay to the Advancement of* MUSICK; *by* Tho. Salmon, *M. A* London, 1672. *in* 8°.

THe deſign of this Eſſay is, to advance *Muſick* by caſting away the Perplexity of *Different Cliffs*, and Uniting all ſorts of Muſick, *Lute, Viol Violin, Organ, Harpſe-chord, Voice, &c.* in one Univerſal Character. And to give the Reader the judgment of an able Maſter in this Art concerning this Tract, he may pleaſe to take that of Mr. *John Birchenſha*, as 'tis extant in the Preface thereof to the Reader, *viz.*

Here is a well-deſign'd Epitome of *Practical* Muſick: For, by this happy contrivance, *the Cliffs, which were many, are reduced into an Univerſal Character; the various ſhifting of Notes in a Syſteme or Staff of lines are fixed; the neceſſity of their Tranſpoſitions taken away: So that he that can Sing or Play any one Part, may ſing or play all Parts; and he that ſhall know his diſtances in any one Part, may know them in all parts.*

The ſame Maſter declaring hereupon, that the benefit of this Eſſay will be ſo great to thoſe who ſhall make uſe of it, that he knows not what to deſire more advantagious for its acceptance, than an Experimental Tryal. Which herewith we recommend to the Ingenious, Lovers of this Art.

Advertiſement.

WHereas *Theon Smyrnæus*, about 600 years ſince, had in a Greek Volume explicated all the Mathematical places in *Plato*, which Volume (as *Blancanus* in the end of his Appendix *In Ariſtotelis loca Mathematica* ſaith) *Joſephus Auria* long ago promiſed to publiſh out of the *Vatican*, by himſelf rendred into Latin; The Publiſher of theſe Tracts, according to his engagement for the Reſuſcitation of obliging Antiquities, and for the Reſtauration and Advancement of the Liberal Arts, inquiring, what was performed therein, was aſſured by his Correſpondent from *Paris*, the ſaid *Theon* was there publiſh't ſome years ago by that Learned and Worthy perſon, *Iſmael Bullialdus*, in Greek and Latin together.

And now it is time to conſult for the reprinting of *Blancanus* in *Ariſtotelis loca Mathematica*, corrected, and with careful emendations of his *Mathematicorum Chronologia*; That ſuch as pretend to the great Names of *Ariſtoth* and *Plato*, may be invited by their authority and example, to learn thoſe Noble Arts. We alſo hope, that thoſe generous Spirits, who may have the help of good Libraries, will recover into publick Light the beſt of Antient writers, illuſtrated by modern diligence, as we have now the Elements of *Diophantus Alexandrinus* his *Algebra*, with the Annotations of *M. Fermat* and *M. Bachet*, &c. See N. 72.

The *INDEX* for this Sixth Volume of *A*.1671.

The *firſt* Figure refers to the *Number* of the Tracts; the *2d*, to the *Page*.

A.

AGRICULTURE Hortulane for beſt Cider. 70. 2128. Choice of Apples and Pears for ſome ſoyl, and for the liquor, &c. 71. 2144.

Ætna's Eruptions; See *Borellus* in the Title of *Books*

Air gradually compreſſed in water, calculated to 1947 foot deep, 73.2191. demonſtrated with a ſcheme, 75.2239.

Anatome; the texture of the Spleen, by *Malpighi*, 71 2149. The ſtructure of the Lungs of Frogs, Tortoiſes, and of other nobler animals, *ib.* Cauſa formatrix of the fœtus examin'd, 74. 2274. Mulierum teſtes eſſe ovario analogos; quæritur, 74 2218. See more de Genital. mulierum, in the Title of *Books*, De Graef. Of the Heart; ſee Lower in *Books*. Petrifications in Human bodies, 71. 2158. Anatome of a Porpeſs, 76. 2274. Anatome of Vegetables; ſee D. *Grew* in Books. Veins in Vegetables analogous to veins in Animals, by M. *Liſter*, 79. 2052. That Reſpiration is nothing but a reciprocation of the Air incloſ'd in the cheſt, and an alternate motion of the Lungs and Diaphragme: And the ſeveral Uſes of Reſpiration, 70.2141.

Antiquities ſollicited, 69. preface. The Origin of Literature, Philology and Philoſophy; ſee Mr. *Gale* in Books. Antient Monuments in upper Egypt, Sphynxes, Temples, &c. 71.2151. The Antient Euripus deſcribed with modern accurateneſs, 71.2153. The Amiantus, or the ſtone yielding an incombuſtible linnen, recover'd, and dreſſed into paper, parchment or leather, and deſign'd for a book, which they would have call'd the Book of Eternity, 72.2167. The Antient numerical Algebra of Diophantus Alex. with modern Additionals, 72.2190. The Antient Geometricians facilitated, 79. 3068. Antient Oars, Gallies, and Sea-fights, and huge Ships; ſee *Meibomius* in Books. Antient and Modern Architecture and Conduct Naval; ſee *Witſen* in Books. *Vitruvius*'s Architecture and Mechanicks deſign'd to be rendred Engliſh, with the choiceſt modern Notes; 72.2190. An hiſtorical Collection of all Antient and Modern ſorts of Drinks, and compared; ſee *Meibomius*. The Antient Heavens compared with the Preſent, and many great Changes, new appearances, returns, and diſ-appearances detected, and conſider'd; 73. 2198. Antiquity claim'd for the *Carteſian* Philoſophy; and *that* Philoſophy digeſted into the School-Method; ſee *Anton. le Grand.* in Books.

Artificial Inſtruments and Engins, or Obſervations, or growth of Arts curious, mechanical contrivances at *Jena* in *Saxony*; 74.2216. The Royal Obſervatory at *Paris* for cæleſtial Diſcoveries, *ibid.* A Cave of 170 ſteps deſcent for refrigerations, coagulations, conſervations, &c. *ibid.* The Minery *Art* of training a load, and of ordering the Tin-mines in *Cornewall*, 69. 2096. Sr. *S. Morelands* loud-ſpeaking Trumpet, 7 . 3056. Obſervations upon the Burning Concave of Lyons, 97.3069. To make any Flower or Fruit grow without Seeds by Art; at leaſt in minute reſemblance, 69.2115. Monſieur *Petit*'s Cylinder Arithmetique to facilitate the Lord *Napiers* Bones, 78. 3043. Opticks and Dioptricks improv'd, and facilitated, 78.3045. See alſo *Numb.* 80. Muſick advanced and facilitated; See *Th. Salmon* in Books. The Art of Levelling, 71.2164.

Aſtronomy: Remarks on New Stars, 73. 2197, 2198. Many changes found in the Conſtellations, *ib.* 2199. A great blot or blackneſs in the Diſc of the Sun, obſerv'd by M. *Boyle* Apr. 27 1660. Spots diſcern'd in the Sun by *Caſſini* Aug. 13. 71. n. 74. 2238. and n. 75.2250. Noted by M. *Hook* Aug. 30. 71. n. 77. 2295. More of Solar Spots, 78. 3019. and 3033. The Eclipſe of the Moon Sept. 8. 71. by domeſtick and forrain Obſervation, 76.2271. and n. 78.3031. The tranſit of ♃ and ☽, 78.3031. To remark the orbite of the Moon, Mr. *Flamſteads* Calculations, 77.2297. and 79.3061. The Satellits of ♃ calculated by *Caſſini*, as for *Uraniburg*, 74. 2238. The Occultation of the firſt of the Circumjovialiſts by ♃, 78. 3031. Saturn's *anſæ* diſ-appearing, 78 3024. and 3034.

B.

Bees ſwarming more early than uſual: the cauſe gueſs'd, 70.2178. Bees hatch't in Willows, 74. 2221. The humming *Bird* of *America*, 74. 2223.

Books. 1. *Autodidactus*, out of an Arabick M.S. of 500 years, rendred Latin by Dr. *Pocock*, to repreſent, How diligence and obſervation aſſiſt for a Philoſophical education, 73.2214.

2. Phil.

2.*Phil. Baldæus* his Deſcription of ſome of the chief parts of the Eaſt-Indies,n.80.

3.*Iſaac Barrow* S.R.Lectiones 18. in quibus Opticorum *Phænomenûm* genuinæ rationes inveſtigantur,75.2278.

4.Ejuſdem Lectiones 13.Geometricæ, in quibus generalia Linearum Curvarum ſymptomata declarantur,*ibid.*

5.*Joh.Joach.Beckeri* Experimentum Chymicum,artificialem & ſubitam Metallorum generationem & tranſmutationem ad oculum demonſtrans, 74. 2232. with a brief touch on his Phyſica Sub-terranea, *ibid.*

6.M.*Bernier* on the Empire of the G.*Mogol* rendred Engliſh,75 2263.

7.*Joh.Alph.Borellus* de motionibus à Gravitate dependentibus,73.2210

8.Ejuſdem Hiſtoria & Meteorologia Incendii Ætnæi A.1669.n.75.2264.

9.M.*Bourdelot* his reſearches and Obſervations upon Vipers,77.3013.

10.Mr.*Boyle* of the Uſefulneſs of Experimental Philoſophy Tom.2.n,72.2179

11. *P. Cherubim* d'*Orleans* la Dioptrique Oculaire,78.3045.

12.*Diophanti Alex.* Arithmeticorum libri 6.cum Comment.Bacheti & Obſervationibus Fermati cui acceſſit Doctrinæ Analyticæ Inventum Novum,72.2185.

13. *Mich.Febr.*M.D.de Abſynthii natura, 74.2235.

14 *Car.*de la *Font* diſſertat. duæ de Veneno Peſtilentiali 73.2210.

15. *Theoph.Gale* his Original of Humane Literature, both Philology and Philoſophy,74.2231.

16. *Regn.de Graef* de Succo Pancreatico, & de Genitalibus Mulierum,79.3056.

17.*Ant.*le *Grand* Philoſophia Veterum è mente Renati Des-Cartes breviter digeſta, 70.2138.

18.Ejuſdem Inſtitutio Philoſophiæ,n 80.

19.*Neh.Grew* S.R.The Anatome of Vegetables begun; with a general accompt of Vegetation grounded thereon,78.3037.

20. *Grimaldi* de Lumine, Coloribus & Iride Phyſico-Matheſis,79.3068.

21.*Frid.Hertodi* Crocologia, 74. 2236.

22.*Th.Hobbs* Roſetum Geometricum,72, 2185.

23. The ſame refuted by Dr.*Wallis* S.R. 73.2202.

24. *Theod. Kerkringii* Anthropogeniæ Ichnographia,70.2136.

25. Idem in Currum Triumphalem Antimonii *Baſ.Valentini*,71.2162.

26. *Frid. Lachmundi* Deſcriptio admirabilium Foſſilium, quæ in Tractu *Hildesheimenſi* reperiuntur,77.3016.

27. *Fr.*de *Lana* Prodromo de alcuni Inventioni nuove, premiſſe al Arte Maeſtra, 69.2114.

28. *Leibnitii* Hypotheſis Phyſica Nova, ſive Theoria de motu Concreto, unà cum Theoria Motûs Abſtracti: and Dr.*Wallis*'s Opinion concerning it,74.2227.

29.*Rich.Lower* S.R.de Corde, & de Motu, & Calore Sanguinis, & Chyli in eum tranſitu: unà cum Diſſertatione de Origine Catarrhi,73.2211.

30.*Dan.Ludovici* Pharmacia moderno ſeculo applicanda, 76.2287.

31.*Joh.Henr. Meibomius* de Cereviſiis potibuſque & Ebriaminibus,&c. Cui additur de Vino Uvæ & Pomorum 69.2116.

32.*Meibom.* de Fabrica Triremium, 79. 3071.

33. *H.Mori* Enchiridion Metaphyſicum, ſive de rebus Incorporeis Diſſertatio, 72. 2182.

34. Sr. *Sam Moreland*'s Loud-ſpeaking Trumpet,79 3056.

35. *Joh. Ott* Cogitationes Phyſico-Mechanicæ de natura Viſionis,71.2163.

36.*Ignace Gaſton Pardies* Elemens de Geometrie, 79.3064.

37.*Sim.Pauli* Botanicum, 76.2291.

38.M.*Petit* Obſervations ſur la nature du Froid & du Chaud; avec un Diſcours ſur la conſtruction & l'uſage d'un Cylindre Arithmetique,78.3043.

39. De Pulmonum Motu, & Reſpirationis uſu nova Hypotheſis,70.2141.

40.*Jaques Rohault* Traité de Phyſique, 70.2138.

41.*Tho.Salmon*'s Advancement of Muſick, n.80.

42. *Nic. Stenonis* Prodromus concerning a Solid in a Solid,Engliſhed,72.2186.

43. *Joh.Bapt. Sylvatici* Inſtitutio Medica de iis,qui morbum ſimulant,deprehendendis,76.2289.

44. *Fr.* de le *Boe* Sylvii Praxis Medicæ Idea,71.2159.

45 *Ejuſdem* Oratio de affectûs Epidemii, Leidam A.1669.depopulantis,Cauſis naturalibus,73.2212.

46.*Theon Smyrnæus* rendred Latin by M. *Bulliald*,80.p 3095.

47. *Matth.Tillingius* de Laudano Opiato, 74.2237.

48. *Mich Vanſlebius* Relatione dello Stato preſente del Egypto,71.2170.

49. Notice of *Vitruvius*, to be rendred Engliſh, with the choiceſt modern notes, and diagrams.72.2190.

50.*Joh.Walliſii* R.S.de Motu Pars 3a,76. 2286.

51. *Goth. Voigtii* Deliciæ Phyſicæ, 77.3017.

52. *Nic. Witſen* of Naval Architecture and Conduct, 77.3006.

So far the Books.

C.

A *Chorographical* Problem ſolv'd by Mr. *Collins* of the R.S. 69.2093.

Good *Cider* more wholeſome than Wine, 69.2118.

Colours for Dyes how to be increaſed; which way to be fixed, 70.2132. See Inſects and Kermes, below.

Of *Colours* a New Theory by Mr. *Iſaac Newton*, of the R.S. n.80.

E.

Euripus his Flux deſcribed, 71.2153.

F.

Fermentations examin'd by *Borellus*, 73. 2210.

Fiſh Stellar deſcribed, 74.2221.

G.

Gloworms, obſervations about their ſhining, 72.2177. and 78.3035.

Gravity conſider'd, 73. 2210. and 74. 2230.

H.

Two *Hurricans* in England, 71.2156.

I.

Ice, how it appears when made in a place free from Air, 72.2169.

Indies, Natural Obſervations of the Eaſt-Indies; See *Baldæus* in Books.

Inſects; A viviparous Fly; of 33 ſorts of Spiders in England, 72.2174. Spontaneous generation inquired and doubted, 74. 2219. Bees hatch'd in willows, 74.2221. Waſps, call'd Ichneumons; their ſeveral ways of breeding; and of their laying their Eggs in the bodies of Caterpillars, 76.2297. Snails are both male and female; and that Caterpillars may teach us, by their feeding, the correſpondence of vertues in plants, 76.2282. Inſects feeding on Henbane, and in their bodies correcting the horrid ſmell of henbane into an Aromatick; their Eggs alſo changing from a white to an Orange or deeper colour, 72. 2170. Inſects ſmelling of Musk, 74. 2219. and 76. 2281. more of Inſects, 76. 2284, 2285. and n.77.3002. The Goat-chaffer or ſweet Beetle in what ſeaſon musky, 77. 3003. The Musk-ant, 77.3002. Whether the Tarantula be not a phalangium, 77. 3002. A Scolopendra ſhining in the dark, 24. 2221. See Gloworms. Inſects in England of the Kermes kind, 71. 2165. and n.75.2196.

L.

Of *Light* and Colours a New and very Ingenious Theory, by Mr. *Iſaack Newton*, R.S. n.80.

M.

Mathematicks and *Mechanicks*. See *Art*.

A ſweet *Mineral* Balſom newly found in Italy, 79.3059.

An Incombuſtible *Mineral* lately found in Italy, 72.2167. *Mineral Art*, ſee *Art*.

N.

Natural Obſervations, See *Baldæus* in Books.

P.

Pears for ſome ſoyl and for peculiar uſes recommended, 71.2147.

Petrifications conſider'd in curious figures, 76.2282. in human bodies, 71.2158.

S.

Snails, 76.2282. *Spiders*; ſee *Inſects*.

A *Salt* of a ſtrange kind, 79.3069.

T.

The *Torrid Zone* known to be habitable above 500 years ago, 73.2214.

The Loud-ſpeaking *Trumpet*, 79.3056.

V.

Vegetation; ſee Dr. *Grews* Anatome, in Books. Veins in *Vegetables* analogous to Veins in Animals, 79. 3051. To make any fruit or flower grow by Art and without ſeed, at leaſt in minute reſemblance. See *Luna* in Books.

Vegetable Excreſcencies, breeding Inſects, conſider'd by Mr. *Liſter*, R.S. 75. 2254

Note.

A corrupt *Tranſlation* of theſe *Phil. Tranſactions* into *Latin*, animadverted upon, 75.2269.

ERRATA in *Number* 79. *Page* 3054. *l.* 18. r. *are not wanting.* ibid. *l.* 19. r. *And in theſe.*

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*. 1671.